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**Department of Defense
Fiscal Year (FY) 2020 Budget Estimates**

March 2019



Air Force

Justification Book Volume 2 of 3

Research, Development, Test & Evaluation, Air Force

Vol-II

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Air Force • Budget Estimates FY 2020 • RDT&E Program

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Fiscal Year (FY) 2020 Budget Estimates RDT&E Descriptive Summaries Budget Activities March 2019

INTRODUCTION AND EXPLANATION OF CONTENTS

GENERAL

- This document has been prepared to provide information on the United States Air Force (USAF) Research, Development, Test and Evaluation (RDT&E) program elements and projects in the FY 2020 President's Budget.
 - All exhibits in this document have been assembled in accordance with DoD 7000.14R, Financial Management Regulation, Volume 2B, Chapter 5.
 - Other comments on exhibit contents in this document:
 - Exhibits R-2/2a and R-3 provide narrative information for all RDT&E program elements and projects within the USAF FY 2020 RDT&E program with the exception of classified program elements. The format and contents of this document are in accordance to the guidelines and requirements of the Congressional committees in so far as possible.
 - The "Other Program Funding Summary portion of the R-2 includes, in addition to RDTE& funds, Procurement funds and quantities, Military Construction appropriation funds on specific development programs, Operations and Maintenance appropriation funds where they are essential to the development effort described, and where appropriate, Department of Energy (DOE) costs.

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- All exhibits contained in Volumes I, II, and III are unclassified. Classified exhibits are not included in the submission due to the level of security classification and necessity of special security clearances.

RDT&E, Air Force Overseas Contingency Operations (OCO)

- FY2020 OCO can be separated into the following categories:
 - OCO for Direct War Costs (\$44,335,000): Direct War costs are those combat or direct combat support costs that will not continue to be expended once combat operations end at major contingency locations.
 - OCO for Enduring Requirements (\$83,913,000): OCO for Enduring Requirements are enduring in-theater and in-CONUS costs that will likely remain after combat operations cease, and have previously been funded in OCO.
 - OCO for Base Requirements (\$322,000,000): OCO for Base Requirements is OCO funding for base budget requirements in support of the National Defense Strategy. The Budget requests these funds in OCO to comply with the base budget defense caps included in the Budget Control Act of 2011.

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Department of Defense
 FY 2020 President's Budget
 Exhibit R-1 FY 2020 President's Budget
 Total Obligational Authority
 (Dollars in Thousands)

19 Feb 2019

| Appropriation ----- | FY 2018 (Base + OCO) ----- | FY 2019 Base Enacted ----- | FY 2019 OCO Enacted ----- | FY 2019 Total Enacted ----- |
|--|----------------------------------|----------------------------------|---------------------------------|-----------------------------------|
| Research, Development, Test & Eval, AF | 38,077,597 | 41,166,683 | 321,934 | 41,488,617 |
| Total Research, Development, Test & Evaluation | 38,077,597 | 41,166,683 | 321,934 | 41,488,617 |

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Department of Defense
 FY 2020 President's Budget
 Exhibit R-1 FY 2020 President's Budget
 Total Obligational Authority
 (Dollars in Thousands)

19 Feb 2019

| Appropriation | FY 2020 Base | FY 2020 OCO for Base Requirements | FY 2020 OCO for Direct War and Enduring Costs | FY 2020 Total OCO | FY 2020 Total (Base + OCO) |
|--|-----------------|---|---|-------------------------|----------------------------------|
| Research, Development, Test & Eval, AF | 45,616,122 | 322,000 | 128,248 | 450,248 | 46,066,370 |
| Total Research, Development, Test & Evaluation | 45,616,122 | 322,000 | 128,248 | 450,248 | 46,066,370 |

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Department of Defense
 FY 2020 President's Budget
 Exhibit R-1 FY 2020 President's Budget
 Total Obligational Authority
 (Dollars in Thousands)

19 Feb 2019

| Summary Recap of Budget Activities ----- | FY 2018 (Base + OCO) | FY 2019 Base Enacted | FY 2019 OCO Enacted | FY 2019 Total Enacted |
|--|-------------------------|-------------------------|------------------------|--------------------------|
| Basic Research | 491,502 | 561,329 | | 561,329 |
| Applied Research | 1,454,070 | 1,480,573 | | 1,480,573 |
| Advanced Technology Development | 829,525 | 928,747 | | 928,747 |
| Advanced Component Development & Prototypes | 4,962,068 | 6,625,697 | 13,495 | 6,639,192 |
| System Development & Demonstration | 4,407,341 | 5,453,523 | | 5,453,523 |
| Management Support | 3,490,712 | 2,963,117 | | 2,963,117 |
| Operational Systems Development | 22,442,379 | 23,153,697 | 308,439 | 23,462,136 |
| Total Research, Development, Test & Evaluation | 38,077,597 | 41,166,683 | 321,934 | 41,488,617 |
| Summary Recap of FYDP Programs ----- | | | | |
| Strategic Forces | 784,917 | 1,018,923 | 34,000 | 1,052,923 |
| General Purpose Forces | 2,899,628 | 3,077,252 | 53,049 | 3,130,301 |
| Intelligence and Communications | 1,609,415 | 1,438,024 | 54,600 | 1,492,624 |
| Mobility Forces | 550,926 | 898,833 | | 898,833 |
| Research and Development | 11,665,345 | 12,799,979 | | 12,799,979 |
| Central Supply and Maintenance | 97,493 | 96,826 | | 96,826 |
| Training Medical and Other | 2,558 | 2,578 | | 2,578 |
| Administration and Associated Activities | 118,914 | 122,255 | | 122,255 |
| Support of Other Nations | 4,418 | 3,998 | | 3,998 |

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Department of Defense
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 Total Obligational Authority
 (Dollars in Thousands)

19 Feb 2019

| Summary Recap of Budget Activities | FY 2020 Base | FY 2020 OCO for Base Requirements | FY 2020 OCO for Direct War and Enduring Costs | FY 2020 Total OCO | FY 2020 Total (Base + OCO) |
|--|-----------------|---|---|-------------------------|----------------------------------|
| ----- | ----- | ----- | ----- | ----- | ----- |
| Basic Research | 529,761 | | | | 529,761 |
| Applied Research | 1,435,626 | | | | 1,435,626 |
| Advanced Technology Development | 839,153 | | | | 839,153 |
| Advanced Component Development & Prototypes | 8,436,279 | | 44,335 | 44,335 | 8,480,614 |
| System Development & Demonstration | 6,929,244 | | | | 6,929,244 |
| Management Support | 2,916,571 | | | | 2,916,571 |
| Operational Systems Development | 24,529,488 | 322,000 | 83,913 | 405,913 | 24,935,401 |
| Total Research, Development, Test & Evaluation | 45,616,122 | 322,000 | 128,248 | 450,248 | 46,066,370 |
| Summary Recap of FYDP Programs | | | | | |
| ----- | ----- | ----- | ----- | ----- | ----- |
| Strategic Forces | 879,977 | | | | 879,977 |
| General Purpose Forces | 3,488,992 | | 5,200 | 5,200 | 3,494,192 |
| Intelligence and Communications | 1,393,298 | | | | 1,393,298 |
| Mobility Forces | 979,221 | | | | 979,221 |
| Research and Development | 14,419,778 | | 26,450 | 26,450 | 14,446,228 |
| Central Supply and Maintenance | 37,505 | | | | 37,505 |
| Training Medical and Other | 3,542 | | | | 3,542 |
| Administration and Associated Activities | 90,730 | | | | 90,730 |
| Support of Other Nations | 4,071 | | | | 4,071 |

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Department of Defense
 FY 2020 President's Budget
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 (Dollars in Thousands)

19 Feb 2019

| | FY 2018 (Base + OCO) | FY 2019 Base Enacted | FY 2019 OCO Enacted | FY 2019 Total Enacted |
|--|-------------------------|-------------------------|------------------------|--------------------------|
| | ----- | ----- | ----- | ----- |
| Space | 3,554,350 | 4,848,491 | 18,495 | 4,866,986 |
| Classified Programs | 16,789,633 | 16,859,524 | 161,790 | 17,021,314 |
| Total Research, Development, Test & Evaluation | 38,077,597 | 41,166,683 | 321,934 | 41,488,617 |

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Department of Defense
 FY 2020 President's Budget
 Exhibit R-1 FY 2020 President's Budget
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 (Dollars in Thousands)

19 Feb 2019

| | FY 2020 Base | FY 2020 OCO for Base Requirements | FY 2020 OCO for Direct War and Enduring Costs | FY 2020 Total OCO | FY 2020 Total (Base + OCO) |
|--|-----------------|---|---|-------------------------|----------------------------------|
| Space | 6,289,502 | | 17,885 | 17,885 | 6,307,387 |
| Classified Programs | 18,029,506 | 322,000 | 78,713 | 400,713 | 18,430,219 |
| Total Research, Development, Test & Evaluation | 45,616,122 | 322,000 | 128,248 | 450,248 | 46,066,370 |

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 (Dollars in Thousands)

19 Feb 2019

| Summary Recap of Budget Activities ----- | FY 2018 (Base + OCO) | FY 2019 Base Enacted | FY 2019 OCO Enacted | FY 2019 Total Enacted |
|--|-------------------------|-------------------------|------------------------|--------------------------|
| Basic Research | 491,502 | 561,329 | | 561,329 |
| Applied Research | 1,454,070 | 1,480,573 | | 1,480,573 |
| Advanced Technology Development | 829,525 | 928,747 | | 928,747 |
| Advanced Component Development & Prototypes | 4,962,068 | 6,625,697 | 13,495 | 6,639,192 |
| System Development & Demonstration | 4,407,341 | 5,453,523 | | 5,453,523 |
| Management Support | 3,490,712 | 2,963,117 | | 2,963,117 |
| Operational Systems Development | 22,442,379 | 23,153,697 | 308,439 | 23,462,136 |
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| Strategic Forces | 784,917 | 1,018,923 | 34,000 | 1,052,923 |
| General Purpose Forces | 2,899,628 | 3,077,252 | 53,049 | 3,130,301 |
| Intelligence and Communications | 1,609,415 | 1,438,024 | 54,600 | 1,492,624 |
| Mobility Forces | 550,926 | 898,833 | | 898,833 |
| Research and Development | 11,665,345 | 12,799,979 | | 12,799,979 |
| Central Supply and Maintenance | 97,493 | 96,826 | | 96,826 |
| Training Medical and Other | 2,558 | 2,578 | | 2,578 |
| Administration and Associated Activities | 118,914 | 122,255 | | 122,255 |
| Support of Other Nations | 4,418 | 3,998 | | 3,998 |

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 Total Obligational Authority
 (Dollars in Thousands)

19 Feb 2019

| Summary Recap of Budget Activities | FY 2020 Base | FY 2020 OCO for Base Requirements | FY 2020 OCO for Direct War and Enduring Costs | FY 2020 Total OCO | FY 2020 Total (Base + OCO) |
|--|-----------------|---|---|-------------------------|----------------------------------|
| ----- | ----- | ----- | ----- | ----- | ----- |
| Basic Research | 529,761 | | | | 529,761 |
| Applied Research | 1,435,626 | | | | 1,435,626 |
| Advanced Technology Development | 839,153 | | | | 839,153 |
| Advanced Component Development & Prototypes | 8,436,279 | | 44,335 | 44,335 | 8,480,614 |
| System Development & Demonstration | 6,929,244 | | | | 6,929,244 |
| Management Support | 2,916,571 | | | | 2,916,571 |
| Operational Systems Development | 24,529,488 | 322,000 | 83,913 | 405,913 | 24,935,401 |
| Total Research, Development, Test & Evaluation | 45,616,122 | 322,000 | 128,248 | 450,248 | 46,066,370 |
| Summary Recap of FYDP Programs | | | | | |
| ----- | ----- | ----- | ----- | ----- | ----- |
| Strategic Forces | 879,977 | | | | 879,977 |
| General Purpose Forces | 3,488,992 | | 5,200 | 5,200 | 3,494,192 |
| Intelligence and Communications | 1,393,298 | | | | 1,393,298 |
| Mobility Forces | 979,221 | | | | 979,221 |
| Research and Development | 14,419,778 | | 26,450 | 26,450 | 14,446,228 |
| Central Supply and Maintenance | 37,505 | | | | 37,505 |
| Training Medical and Other | 3,542 | | | | 3,542 |
| Administration and Associated Activities | 90,730 | | | | 90,730 |
| Support of Other Nations | 4,071 | | | | 4,071 |

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19 Feb 2019

| Summary Recap of Budget Activities ----- | FY 2018 (Base + OCO) | FY 2019 Base Enacted | FY 2019 OCO Enacted | FY 2019 Total Enacted |
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| Classified Programs | 16,789,633 | 16,859,524 | 161,790 | 17,021,314 |
| Total Research, Development, Test & Evaluation | 38,077,597 | 41,166,683 | 321,934 | 41,488,617 |

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Department of the Air Force
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 (Dollars in Thousands)

19 Feb 2019

| Summary Recap of Budget Activities | FY 2020 Base | FY 2020 OCO for Base Requirements | FY 2020 OCO for Direct War and Enduring Costs | FY 2020 Total OCO | FY 2020 Total (Base + OCO) |
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| Space | 6,289,502 | | 17,885 | 17,885 | 6,307,387 |
| Classified Programs | 18,029,506 | 322,000 | 78,713 | 400,713 | 18,430,219 |
| Total Research, Development, Test & Evaluation | 45,616,122 | 322,000 | 128,248 | 450,248 | 46,066,370 |

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Department of the Air Force
 FY 2020 President's Budget
 Exhibit R-1 FY 2020 President's Budget
 Total Obligational Authority
 (Dollars in Thousands)

19 Feb 2019

Appropriation: 3600F Research, Development, Test & Eval, AF

| Line No | Program Element Number | Item | Act | FY 2018 (Base + OCO) | FY 2019 Base Enacted | FY 2019 OCO Enacted | FY 2019 Total Enacted | Se |
|---------|------------------------|---|-----|----------------------|----------------------|---------------------|-----------------------|----|
| 1 | 0601102F | Defense Research Sciences | 01 | 320,961 | 383,322 | | 383,322 | U |
| 2 | 0601103F | University Research Initiatives | 01 | 157,079 | 164,991 | | 164,991 | U |
| 3 | 0601108F | High Energy Laser Research Initiatives | 01 | 13,462 | 13,016 | | 13,016 | U |
| | | Basic Research | | 491,502 | 561,329 | | 561,329 | |
| 4 | 0602102F | Materials | 02 | 143,900 | 181,373 | | 181,373 | U |
| 5 | 0602201F | Aerospace Vehicle Technologies | 02 | 151,637 | 160,461 | | 160,461 | U |
| 6 | 0602202F | Human Effectiveness Applied Research | 02 | 126,542 | 119,018 | | 119,018 | U |
| 7 | 0602203F | Aerospace Propulsion | 02 | 192,846 | 218,419 | | 218,419 | U |
| 8 | 0602204F | Aerospace Sensors | 02 | 157,078 | 171,307 | | 171,307 | U |
| 9 | 0602212F | Defense Laboratories R&D Projects (10 U.S.C, Sec 2358) | 02 | 74,760 | | | | U |
| 10 | 0602298F | Science and Technology Management - Major Headquarters Activities | 02 | 8,353 | 8,288 | | 8,288 | U |
| 11 | 0602601F | Space Technology | 02 | 145,921 | | | | U |
| 12 | 0602602F | Conventional Munitions | 02 | 99,543 | 112,841 | | 112,841 | U |
| 13 | 0602605F | Directed Energy Technology | 02 | 121,610 | 141,800 | | 141,800 | U |
| 14 | 0602788F | Dominant Information Sciences and Methods | 02 | 191,724 | 185,276 | | 185,276 | U |
| 15 | 0602890F | High Energy Laser Research | 02 | 40,156 | 43,192 | | 43,192 | U |
| 16 | 1206601F | Space Technology | 02 | | 138,598 | | 138,598 | U |
| | | Applied Research | | 1,454,070 | 1,480,573 | | 1,480,573 | |

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Department of the Air Force
 FY 2020 President's Budget
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19 Feb 2019

Appropriation: 3600F Research, Development, Test & Eval, AF

| Line No | Program Element Number | Item | Act | FY 2020 Base | FY 2020 OCO for Base Requirements | FY 2020 OCO for Direct War and Enduring Costs | FY 2020 Total OCO | FY 2020 Total (Base + OCO) | See c |
|---------|------------------------|---|-----|--------------|-----------------------------------|---|-------------------|----------------------------|-------|
| 1 | 0601102F | Defense Research Sciences | 01 | 356,107 | | | | 356,107 | U |
| 2 | 0601103F | University Research Initiatives | 01 | 158,859 | | | | 158,859 | U |
| 3 | 0601108F | High Energy Laser Research Initiatives | 01 | 14,795 | | | | 14,795 | U |
| | | Basic Research | | 529,761 | | | | 529,761 | |
| 4 | 0602102F | Materials | 02 | 128,851 | | | | 128,851 | U |
| 5 | 0602201F | Aerospace Vehicle Technologies | 02 | 147,724 | | | | 147,724 | U |
| 6 | 0602202F | Human Effectiveness Applied Research | 02 | 131,795 | | | | 131,795 | U |
| 7 | 0602203F | Aerospace Propulsion | 02 | 198,775 | | | | 198,775 | U |
| 8 | 0602204F | Aerospace Sensors | 02 | 202,912 | | | | 202,912 | U |
| 9 | 0602212F | Defense Laboratories R&D Projects (10 U.S.C, Sec 2358) | 02 | | | | | | U |
| 10 | 0602298F | Science and Technology Management - Major Headquarters Activities | 02 | 7,968 | | | | 7,968 | U |
| 11 | 0602601F | Space Technology | 02 | | | | | | U |
| 12 | 0602602F | Conventional Munitions | 02 | 142,772 | | | | 142,772 | U |
| 13 | 0602605F | Directed Energy Technology | 02 | 124,379 | | | | 124,379 | U |
| 14 | 0602788F | Dominant Information Sciences and Methods | 02 | 181,562 | | | | 181,562 | U |
| 15 | 0602890F | High Energy Laser Research | 02 | 44,221 | | | | 44,221 | U |
| 16 | 1206601F | Space Technology | 02 | 124,667 | | | | 124,667 | U |
| | | Applied Research | | 1,435,626 | | | | 1,435,626 | |

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Department of the Air Force
 FY 2020 President's Budget
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 (Dollars in Thousands)

19 Feb 2019

Appropriation: 3600F Research, Development, Test & Eval, AF

| Line No | Program Element Number | Item | Act | FY 2018 (Base + OCO) | FY 2019 Base Enacted | FY 2019 OCO Enacted | FY 2019 Total Enacted | Se c |
|---------|------------------------|---|-----|-------------------------|-------------------------|------------------------|--------------------------|---------|
| -- | ----- | ---- | --- | ----- | ----- | ----- | ----- | - |
| 17 | 0603112F | Advanced Materials for Weapon Systems | 03 | 34,694 | 47,426 | | 47,426 | U |
| 18 | 0603199F | Sustainment Science and Technology (S&T) | 03 | 20,724 | 15,150 | | 15,150 | U |
| 19 | 0603203F | Advanced Aerospace Sensors | 03 | 46,784 | 44,968 | | 44,968 | U |
| 20 | 0603211F | Aerospace Technology Dev/Demo | 03 | 103,123 | 126,002 | | 126,002 | U |
| 21 | 0603216F | Aerospace Propulsion and Power Technology | 03 | 122,217 | 148,418 | | 148,418 | U |
| 22 | 0603270F | Electronic Combat Technology | 03 | 56,238 | 55,054 | | 55,054 | U |
| 23 | 0603401F | Advanced Spacecraft Technology | 03 | 94,946 | 70,734 | | 70,734 | U |
| 24 | 0603444F | Maui Space Surveillance System (MSSS) | 03 | 9,755 | 10,674 | | 10,674 | U |
| 25 | 0603456F | Human Effectiveness Advanced Technology Development | 03 | 30,153 | 36,420 | | 36,420 | U |
| 26 | 0603601F | Conventional Weapons Technology | 03 | 157,676 | 204,756 | | 204,756 | U |
| 27 | 0603605F | Advanced Weapons Technology | 03 | 42,322 | 43,368 | | 43,368 | U |
| 28 | 0603680F | Manufacturing Technology Program | 03 | 63,224 | 65,760 | | 65,760 | U |
| 29 | 0603788F | Battlespace Knowledge Development and Demonstration | 03 | 45,481 | 60,017 | | 60,017 | U |
| 30 | 0303467F | SENSR Spectrum Pipeline SRF | 03 | 2,188 | | | | U |
| | | Advanced Technology Development | | 829,525 | 928,747 | | 928,747 | |
| 31 | 0603260F | Intelligence Advanced Development | 04 | 7,652 | 5,568 | | 5,568 | U |
| 32 | 0603742F | Combat Identification Technology | 04 | 23,578 | 18,194 | | 18,194 | U |

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 FY 2020 President's Budget
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 (Dollars in Thousands)

19 Feb 2019

Appropriation: 3600F Research, Development, Test & Eval, AF

| Line No | Program Element Number | Item | Act | FY 2020 Base | FY 2020 OCO for Base Requirements | FY 2020 OCO for Direct War and Enduring Costs | FY 2020 Total OCO | FY 2020 Total (Base + OCO) | Se |
|---------|------------------------|---|-----|--------------|-----------------------------------|---|-------------------|----------------------------|----|
| 17 | 0603112F | Advanced Materials for Weapon Systems | 03 | 36,586 | | | | 36,586 | U |
| 18 | 0603199F | Sustainment Science and Technology (S&T) | 03 | 16,249 | | | | 16,249 | U |
| 19 | 0603203F | Advanced Aerospace Sensors | 03 | 38,292 | | | | 38,292 | U |
| 20 | 0603211F | Aerospace Technology Dev/Demo | 03 | 102,949 | | | | 102,949 | U |
| 21 | 0603216F | Aerospace Propulsion and Power Technology | 03 | 113,973 | | | | 113,973 | U |
| 22 | 0603270F | Electronic Combat Technology | 03 | 48,408 | | | | 48,408 | U |
| 23 | 0603401F | Advanced Spacecraft Technology | 03 | 70,525 | | | | 70,525 | U |
| 24 | 0603444F | Maui Space Surveillance System (MSSS) | 03 | 11,878 | | | | 11,878 | U |
| 25 | 0603456F | Human Effectiveness Advanced Technology Development | 03 | 37,542 | | | | 37,542 | U |
| 26 | 0603601F | Conventional Weapons Technology | 03 | 225,817 | | | | 225,817 | U |
| 27 | 0603605F | Advanced Weapons Technology | 03 | 37,404 | | | | 37,404 | U |
| 28 | 0603680F | Manufacturing Technology Program | 03 | 43,116 | | | | 43,116 | U |
| 29 | 0603788F | Battlespace Knowledge Development and Demonstration | 03 | 56,414 | | | | 56,414 | U |
| 30 | 0303467F | SENSR Spectrum Pipeline SRF | 03 | | | | | | U |
| | | Advanced Technology Development | | 839,153 | | | | 839,153 | |
| 31 | 0603260F | Intelligence Advanced Development | 04 | 5,672 | | | | 5,672 | U |
| 32 | 0603742F | Combat Identification Technology | 04 | 27,085 | | | | 27,085 | U |

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Department of the Air Force
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 Total Obligational Authority
 (Dollars in Thousands)

19 Feb 2019

Appropriation: 3600F Research, Development, Test & Eval, AF

| Line No | Program Element Number | Item | Act | FY 2018 (Base + OCO) | FY 2019 Base Enacted | FY 2019 OCO Enacted | FY 2019 Total Enacted | Se |
|---------|------------------------|---|-----|-------------------------|-------------------------|------------------------|--------------------------|-----|
| --- | ----- | ---- | --- | ----- | ----- | ----- | ----- | --- |
| 33 | 0603790F | NATO Research and Development | 04 | 3,710 | 2,305 | | 2,305 | U |
| 34 | 0603851F | Intercontinental Ballistic Missile - Dem/Val | 04 | 27,424 | 32,356 | | 32,356 | U |
| 35 | 0603859F | Pollution Prevention - Dem/Val | 04 | 2 | 200 | | 200 | U |
| 36 | 0604002F | Air Force Weather Services Research | 04 | | | | | U |
| 37 | 0604004F | Advanced Engine Development | 04 | | 720,355 | | 720,355 | U |
| 38 | 0604015F | Long Range Strike - Bomber | 04 | 1,914,611 | 2,279,196 | | 2,279,196 | U |
| 39 | 0604032F | Directed Energy Prototyping | 04 | | 50,000 | | 50,000 | U |
| 40 | 0604033F | Hypersonics Prototyping | 04 | | 508,858 | | 508,858 | U |
| 41 | 0604201F | PNT Resiliency, Mods, and Improvements | 04 | 63,302 | 81,271 | | 81,271 | U |
| 42 | 0604257F | Advanced Technology and Sensors | 04 | 78,122 | 34,585 | | 34,585 | U |
| 43 | 0604288F | National Airborne Ops Center (NAOC) Recap | 04 | 6,141 | 7,440 | | 7,440 | U |
| 44 | 0604317F | Technology Transfer | 04 | 17,644 | 16,924 | | 16,924 | U |
| 45 | 0604327F | Hard and Deeply Buried Target Defeat System (HDBTDS) Program | 04 | 39,682 | 36,701 | | 36,701 | U |
| 46 | 0604414F | Cyber Resiliency of Weapon Systems-ACS | 04 | 41,055 | 62,618 | | 62,618 | U |
| 47 | 0604776F | Deployment & Distribution Enterprise R&D | 04 | 25,597 | 27,964 | | 27,964 | U |
| 48 | 0604858F | Tech Transition Program | 04 | 1,079,458 | 167,277 | | 167,277 | U |
| 49 | 0605230F | Ground Based Strategic Deterrent | 04 | 221,536 | 414,441 | | 414,441 | U |

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Appropriation: 3600F Research, Development, Test & Eval, AF

| Line No | Program Element Number | Item | Act | FY 2020 Base | FY 2020 OCO for Base Requirements | FY 2020 OCO for Direct War and Enduring Costs | FY 2020 Total OCO | FY 2020 Total (Base + OCO) | Se |
|---------|------------------------|--|-----|--------------|-----------------------------------|---|-------------------|----------------------------|----|
| 33 | 0603790F | NATO Research and Development | 04 | 4,955 | | | | 4,955 | U |
| 34 | 0603851F | Intercontinental Ballistic Missile - Dem/Val | 04 | 44,109 | | | | 44,109 | U |
| 35 | 0603859F | Pollution Prevention - Dem/Val | 04 | | | | | | U |
| 36 | 0604002F | Air Force Weather Services Research | 04 | 772 | | | | 772 | U |
| 37 | 0604004F | Advanced Engine Development | 04 | 878,442 | | | | 878,442 | U |
| 38 | 0604015F | Long Range Strike - Bomber | 04 | 3,003,899 | | | | 3,003,899 | U |
| 39 | 0604032F | Directed Energy Prototyping | 04 | 10,000 | | | | 10,000 | U |
| 40 | 0604033F | Hypersonics Prototyping | 04 | 576,000 | | | | 576,000 | U |
| 41 | 0604201F | PNT Resiliency, Mods, and Improvements | 04 | 92,600 | | | | 92,600 | U |
| 42 | 0604257F | Advanced Technology and Sensors | 04 | 23,145 | | | | 23,145 | U |
| 43 | 0604288F | National Airborne Ops Center (NAOC) Recap | 04 | 16,669 | | | | 16,669 | U |
| 44 | 0604317F | Technology Transfer | 04 | 23,614 | | | | 23,614 | U |
| 45 | 0604327F | Hard and Deeply Buried Target Defeat System (HDBTDS) Program | 04 | 113,121 | | | | 113,121 | U |
| 46 | 0604414F | Cyber Resiliency of Weapon Systems-ACS | 04 | 56,325 | | | | 56,325 | U |
| 47 | 0604776F | Deployment & Distribution Enterprise R&D | 04 | 28,034 | | | | 28,034 | U |
| 48 | 0604858F | Tech Transition Program | 04 | 128,476 | | 26,450 | 26,450 | 154,926 | U |
| 49 | 0605230F | Ground Based Strategic Deterrent | 04 | 570,373 | | | | 570,373 | U |

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| Line No | Program Element Number | Item | Act | FY 2018 (Base + OCO) | FY 2019 Base Enacted | FY 2019 OCO Enacted | FY 2019 Total Enacted | Se |
|---------|------------------------|--|-----|----------------------|----------------------|---------------------|-----------------------|----|
| 50 | 0207100F | Light Attack Armed Reconnaissance (LAAR) Squadrons | 04 | | | | | U |
| 51 | 0207110F | Next Generation Air Dominance | 04 | 283,964 | 429,610 | | 429,610 | U |
| 52 | 0207455F | Three Dimensional Long-Range Radar (3DELRR) | 04 | 12,122 | 24,856 | | 24,856 | U |
| 53 | 0208099F | Unified Platform (UP) | 04 | | 29,800 | | 29,800 | U |
| 54 | 0305236F | Common Data Link Executive Agent (CDL EA) | 04 | 40,838 | 41,880 | | 41,880 | U |
| 55 | 0305251F | Cyberspace Operations Forces and Force Support | 04 | | | | | U |
| 56 | 0305601F | Mission Partner Environments | 04 | | 10,074 | | 10,074 | U |
| 57 | 0306250F | Cyber Operations Technology Development | 04 | 278,521 | 246,502 | | 246,502 | U |
| 58 | 0306415F | Enabled Cyber Activities | 04 | 16,687 | 16,325 | | 16,325 | U |
| 59 | 0408011F | Special Tactics / Combat Control | 04 | 4,266 | | | | U |
| 60 | 0901410F | Contracting Information Technology System | 04 | 18,973 | 17,577 | | 17,577 | U |
| 61 | 1203164F | NAVSTAR Global Positioning System (User Equipment) (SPACE) | 04 | 321,186 | 252,834 | | 252,834 | U |
| 62 | 1203710F | EO/IR Weather Systems | 04 | 8,000 | 7,940 | | 7,940 | U |
| 63 | 1206422F | Weather System Follow-on | 04 | 98,396 | 138,052 | | 138,052 | U |
| 64 | 1206425F | Space Situation Awareness Systems | 04 | 43,290 | 33,469 | | 33,469 | U |
| 65 | 1206427F | Space Systems Prototype Transitions (SSPT) | 04 | | | | | U |

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| Line No | Program Element Number | Item | Act | FY 2020 Base | FY 2020 OCO for Base Requirements | FY 2020 OCO for Direct War and Enduring Costs | FY 2020 Total OCO | FY 2020 Total (Base + OCO) | See |
|---------|------------------------|--|-----|--------------|-----------------------------------|---|-------------------|----------------------------|-----|
| 50 | 0207100F | Light Attack Armed Reconnaissance (LAAR) Squadrons | 04 | 35,000 | | | | 35,000 | U |
| 51 | 0207110F | Next Generation Air Dominance | 04 | 1,000,000 | | | | 1,000,000 | U |
| 52 | 0207455F | Three Dimensional Long-Range Radar (3DELRR) | 04 | 37,290 | | | | 37,290 | U |
| 53 | 0208099F | Unified Platform (UP) | 04 | 10,000 | | | | 10,000 | U |
| 54 | 0305236F | Common Data Link Executive Agent (CDL EA) | 04 | 36,910 | | | | 36,910 | U |
| 55 | 0305251F | Cyberspace Operations Forces and Force Support | 04 | 35,000 | | | | 35,000 | U |
| 56 | 0305601F | Mission Partner Environments | 04 | 8,550 | | | | 8,550 | U |
| 57 | 0306250F | Cyber Operations Technology Development | 04 | 198,864 | | | | 198,864 | U |
| 58 | 0306415F | Enabled Cyber Activities | 04 | 16,632 | | | | 16,632 | U |
| 59 | 0408011F | Special Tactics / Combat Control | 04 | | | | | | U |
| 60 | 0901410F | Contracting Information Technology System | 04 | 20,830 | | | | 20,830 | U |
| 61 | 1203164F | NAVSTAR Global Positioning System (User Equipment) (SPACE) | 04 | 329,948 | | | | 329,948 | U |
| 62 | 1203710F | EO/IR Weather Systems | 04 | 101,222 | | | | 101,222 | U |
| 63 | 1206422F | Weather System Follow-on | 04 | 225,660 | | | | 225,660 | U |
| 64 | 1206425F | Space Situation Awareness Systems | 04 | 29,776 | | | | 29,776 | U |
| 65 | 1206427F | Space Systems Prototype Transitions (SSPT) | 04 | 142,045 | | | | 142,045 | U |

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| Line No | Program Element Number | Item | Act | FY 2018 (Base + OCO) | FY 2019 Base Enacted | FY 2019 OCO Enacted | FY 2019 Total Enacted | Se |
|---------|------------------------|--|-----|----------------------|----------------------|---------------------|-----------------------|----|
| 66 | 1206434F | Midterm Polar MILSATCOM System | 04 | 60,123 | 383,113 | | 383,113 | U |
| 67 | 1206438F | Space Control Technology | 04 | 44,139 | 90,546 | 1,100 | 91,646 | U |
| 68 | 1206730F | Space Security and Defense Program | 04 | 41,385 | 45,542 | | 45,542 | U |
| 69 | 1206760F | Protected Tactical Enterprise Service (PTES) | 04 | 17,552 | 46,419 | | 46,419 | U |
| 70 | 1206761F | Protected Tactical Service (PTS) | 04 | 23,404 | 29,626 | | 29,626 | U |
| 71 | 1206855F | Evolved Strategic SATCOM (ESS) | 04 | 15,473 | 29,229 | | 29,229 | U |
| 72 | 1206857F | Space Rapid Capabilities Office | 04 | 84,235 | 286,050 | 12,395 | 298,445 | U |
| | | Advanced Component Development & Prototypes | | 4,962,068 | 6,625,697 | 13,495 | 6,639,192 | |
| 73 | 0604200F | Future Advanced Weapon Analysis & Programs | 05 | 5,108 | 39,602 | | 39,602 | U |
| 74 | 0604201F | PNT Resiliency, Mods, and Improvements | 05 | 97,943 | 46,731 | | 46,731 | U |
| 75 | 0604222F | Nuclear Weapons Support | 05 | 2,910 | 4,468 | | 4,468 | U |
| 76 | 0604270F | Electronic Warfare Development | 05 | 2,159 | 1,909 | | 1,909 | U |
| 77 | 0604281F | Tactical Data Networks Enterprise | 05 | 42,128 | 270,015 | | 270,015 | U |
| 78 | 0604287F | Physical Security Equipment | 05 | 39,639 | 14,421 | | 14,421 | U |
| 79 | 0604329F | Small Diameter Bomb (SDB) - EMD | 05 | 37,667 | 78,091 | | 78,091 | U |
| 80 | 0604429F | Airborne Electronic Attack | 05 | 4,910 | 6,153 | | 6,153 | U |
| 81 | 0604602F | Armament/Ordnance Development | 05 | 16,765 | 49,590 | | 49,590 | U |
| 82 | 0604604F | Submunitions | 05 | 2,697 | 2,990 | | 2,990 | U |
| 83 | 0604617F | Agile Combat Support | 05 | 36,351 | 23,489 | | 23,489 | U |

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|---------|------------------------|--|-----|--------------|-----------------------------------|---|-------------------|----------------------------|----|
| 66 | 1206434F | Midterm Polar MILSATCOM System | 04 | | | | | | U |
| 67 | 1206438F | Space Control Technology | 04 | 64,231 | | | | 64,231 | U |
| 68 | 1206730F | Space Security and Defense Program | 04 | 56,385 | | | | 56,385 | U |
| 69 | 1206760F | Protected Tactical Enterprise Service (PTES) | 04 | 105,003 | | | | 105,003 | U |
| 70 | 1206761F | Protected Tactical Service (PTS) | 04 | 173,694 | | | | 173,694 | U |
| 71 | 1206855F | Evolved Strategic SATCOM (ESS) | 04 | 172,206 | | | | 172,206 | U |
| 72 | 1206857F | Space Rapid Capabilities Office | 04 | 33,742 | | 17,885 | 17,885 | 51,627 | U |
| | | Advanced Component Development & Prototypes | | 8,436,279 | | 44,335 | 44,335 | 8,480,614 | |
| 73 | 0604200F | Future Advanced Weapon Analysis & Programs | 05 | 246,200 | | | | 246,200 | U |
| 74 | 0604201F | PNT Resiliency, Mods, and Improvements | 05 | 67,782 | | | | 67,782 | U |
| 75 | 0604222F | Nuclear Weapons Support | 05 | 4,406 | | | | 4,406 | U |
| 76 | 0604270F | Electronic Warfare Development | 05 | 2,066 | | | | 2,066 | U |
| 77 | 0604281F | Tactical Data Networks Enterprise | 05 | 229,631 | | | | 229,631 | U |
| 78 | 0604287F | Physical Security Equipment | 05 | 9,700 | | | | 9,700 | U |
| 79 | 0604329F | Small Diameter Bomb (SDB) - EMD | 05 | 31,241 | | | | 31,241 | U |
| 80 | 0604429F | Airborne Electronic Attack | 05 | 2 | | | | 2 | U |
| 81 | 0604602F | Armament/Ordnance Development | 05 | 28,043 | | | | 28,043 | U |
| 82 | 0604604F | Submunitions | 05 | 3,045 | | | | 3,045 | U |
| 83 | 0604617F | Agile Combat Support | 05 | 19,944 | | | | 19,944 | U |

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|---------|------------------------|--------------------------------------|-----|----------------------|----------------------|---------------------|-----------------------|----|
| 84 | 0604706F | Life Support Systems | 05 | 10,342 | 8,919 | | 8,919 | U |
| 85 | 0604735F | Combat Training Ranges | 05 | 75,981 | 43,895 | | 43,895 | U |
| 86 | 0604800F | F-35 - EMD | 05 | 282,126 | 69,001 | | 69,001 | U |
| 87 | 0604932F | Long Range Standoff Weapon | 05 | 437,521 | 664,920 | | 664,920 | U |
| 88 | 0604933F | ICBM Fuze Modernization | 05 | 166,571 | 167,659 | | 167,659 | U |
| 89 | 0605030F | Joint Tactical Network Center (JTNC) | 05 | 404 | | | | U |
| 90 | 0605031F | Joint Tactical Network (JTN) | 05 | 1,331 | | | | U |
| 91 | 0605056F | Open Architecture Management | 05 | | | | | U |
| 92 | 0605213F | F-22 Modernization Increment 3.2B | 05 | 10,482 | | | | U |
| 93 | 0605221F | KC-46 | 05 | 75,598 | 80,170 | | 80,170 | U |
| 94 | 0605223F | Advanced Pilot Training | 05 | 82,628 | 245,465 | | 245,465 | U |
| 95 | 0605229F | Combat Rescue Helicopter | 05 | 342,030 | 445,652 | | 445,652 | U |
| 96 | 0605458F | Air & Space Ops Center 10.2 RDT&E | 05 | 4,666 | | | | U |
| 97 | 0605830F | Acq Workforce- Global Battle Mgmt | 05 | | 3,617 | | 3,617 | U |
| 98 | 0605931F | B-2 Defensive Management System | 05 | 148,946 | 253,258 | | 253,258 | U |
| 99 | 0101125F | Nuclear Weapons Modernization | 05 | 81,631 | 81,592 | | 81,592 | U |
| 100 | 0101213F | Minuteman Squadrons | 05 | | | | | U |
| 101 | 0207171F | F-15 EPAWSS | 05 | 202,167 | 137,095 | | 137,095 | U |
| 102 | 0207328F | Stand In Attack Weapon | 05 | 3,288 | 14,975 | | 14,975 | U |
| 103 | 0207701F | Full Combat Mission Training | 05 | 8,427 | 1,015 | | 1,015 | U |

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| Line No | Program Element Number | Item | Act | FY 2020 Base | FY 2020 OCO for Base Requirements | FY 2020 OCO for Direct War and Enduring Costs | FY 2020 Total OCO | FY 2020 Total (Base + OCO) | See c |
|---------|------------------------|--------------------------------------|-----|--------------|-----------------------------------|---|-------------------|----------------------------|-------|
| 84 | 0604706F | Life Support Systems | 05 | 8,624 | | | | 8,624 | U |
| 85 | 0604735F | Combat Training Ranges | 05 | 37,365 | | | | 37,365 | U |
| 86 | 0604800F | F-35 - EMD | 05 | 7,628 | | | | 7,628 | U |
| 87 | 0604932F | Long Range Standoff Weapon | 05 | 712,539 | | | | 712,539 | U |
| 88 | 0604933F | ICBM Fuze Modernization | 05 | 161,199 | | | | 161,199 | U |
| 89 | 0605030F | Joint Tactical Network Center (JTNC) | 05 | 2,414 | | | | 2,414 | U |
| 90 | 0605031F | Joint Tactical Network (JTN) | 05 | | | | | | U |
| 91 | 0605056F | Open Architecture Management | 05 | 30,000 | | | | 30,000 | U |
| 92 | 0605213F | F-22 Modernization Increment 3.2B | 05 | | | | | | U |
| 93 | 0605221F | KC-46 | 05 | 59,561 | | | | 59,561 | U |
| 94 | 0605223F | Advanced Pilot Training | 05 | 348,473 | | | | 348,473 | U |
| 95 | 0605229F | Combat Rescue Helicopter | 05 | 247,047 | | | | 247,047 | U |
| 96 | 0605458F | Air & Space Ops Center 10.2 RDT&E | 05 | | | | | | U |
| 97 | 0605830F | Acq Workforce- Global Battle Mgmt | 05 | | | | | | U |
| 98 | 0605931F | B-2 Defensive Management System | 05 | 294,400 | | | | 294,400 | U |
| 99 | 0101125F | Nuclear Weapons Modernization | 05 | 27,564 | | | | 27,564 | U |
| 100 | 0101213F | Minuteman Squadrons | 05 | 1 | | | | 1 | U |
| 101 | 0207171F | F-15 EPAWSS | 05 | 47,322 | | | | 47,322 | U |
| 102 | 0207328F | Stand In Attack Weapon | 05 | 162,840 | | | | 162,840 | U |
| 103 | 0207701F | Full Combat Mission Training | 05 | 9,797 | | | | 9,797 | U |

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| Line No | Program Element Number | Item | Act | FY 2018 (Base + OCO) | FY 2019 Base Enacted | FY 2019 OCO Enacted | FY 2019 Total Enacted | Se |
|---------|------------------------|--|-----|----------------------|----------------------|---------------------|-----------------------|----|
| 104 | 0303267F | Auctioned Spectrum Relocation Fund | 05 | 60,546 | | | | U |
| 105 | 0307581F | JSTARS Recap | 05 | 390,713 | | | | U |
| 106 | 0401310F | C-32 Executive Transport Recapitalization | 05 | 2,918 | 7,943 | | 7,943 | U |
| 107 | 0401319F | VC-25B | 05 | 418,500 | 657,932 | | 657,932 | U |
| 108 | 0701212F | Automated Test Systems | 05 | 17,850 | 13,653 | | 13,653 | U |
| 109 | 1203176F | Combat Survivor Evader Locator | 05 | 24,099 | 939 | | 939 | U |
| 110 | 1203269F | GPS III Follow-On (GPS IIIF) | 05 | | 426,889 | | 426,889 | U |
| 111 | 1203940F | Space Situation Awareness Operations | 05 | 9,684 | 46,015 | | 46,015 | U |
| 112 | 1206421F | Counterspace Systems | 05 | 64,208 | 20,242 | | 20,242 | U |
| 113 | 1206422F | Weather System Follow-on | 05 | | | | | U |
| 114 | 1206425F | Space Situation Awareness Systems | 05 | 47,580 | 134,464 | | 134,464 | U |
| 115 | 1206426F | Space Fence | 05 | 34,022 | 19,425 | | 19,425 | U |
| 116 | 1206431F | Advanced EHF MILSATCOM (SPACE) | 05 | 134,775 | 144,753 | | 144,753 | U |
| 117 | 1206432F | Polar MILSATCOM (SPACE) | 05 | 32,536 | 26,380 | | 26,380 | U |
| 118 | 1206433F | Wideband Global SATCOM (SPACE) | 05 | 6,535 | 3,970 | | 3,970 | U |
| 119 | 1206441F | Space Based Infrared System (SBIRS) High EMD | 05 | 119,585 | 60,565 | | 60,565 | U |
| 120 | 1206442F | Next Generation OPIR | 05 | 439,497 | 643,126 | | 643,126 | U |
| 121 | 1206445F | Commercial SATCOM (COMSATCOM) Integration | 05 | | 49,500 | | 49,500 | U |

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|---------|------------------------|--|-----|--------------|-----------------------------------|---|-------------------|----------------------------|----|
| 104 | 0303267F | Auctioned Spectrum Relocation Fund | 05 | | | | | | U |
| 105 | 0307581F | JSTARS Recap | 05 | | | | | | U |
| 106 | 0401310F | C-32 Executive Transport Recapitalization | 05 | 9,930 | | | | 9,930 | U |
| 107 | 0401319F | VC-25B | 05 | 757,923 | | | | 757,923 | U |
| 108 | 0701212F | Automated Test Systems | 05 | 2,787 | | | | 2,787 | U |
| 109 | 1203176F | Combat Survivor Evader Locator | 05 | 2,000 | | | | 2,000 | U |
| 110 | 1203269F | GPS III Follow-On (GPS IIIF) | 05 | 462,875 | | | | 462,875 | U |
| 111 | 1203940F | Space Situation Awareness Operations | 05 | 76,829 | | | | 76,829 | U |
| 112 | 1206421F | Counterspace Systems | 05 | 29,037 | | | | 29,037 | U |
| 113 | 1206422F | Weather System Follow-on | 05 | 2,237 | | | | 2,237 | U |
| 114 | 1206425F | Space Situation Awareness Systems | 05 | 412,894 | | | | 412,894 | U |
| 115 | 1206426F | Space Fence | 05 | | | | | | U |
| 116 | 1206431F | Advanced EHF MILSATCOM (SPACE) | 05 | 117,290 | | | | 117,290 | U |
| 117 | 1206432F | Polar MILSATCOM (SPACE) | 05 | 427,400 | | | | 427,400 | U |
| 118 | 1206433F | Wideband Global SATCOM (SPACE) | 05 | 1,920 | | | | 1,920 | U |
| 119 | 1206441F | Space Based Infrared System (SBIRS) High EMD | 05 | 1 | | | | 1 | U |
| 120 | 1206442F | Next Generation OPIR | 05 | 1,395,278 | | | | 1,395,278 | U |
| 121 | 1206445F | Commercial SATCOM (COMSATCOM) Integration | 05 | | | | | | U |

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| Line No | Program Element Number | Item | Act | FY 2018 (Base + OCO) | FY 2019 Base Enacted | FY 2019 OCO Enacted | FY 2019 Total Enacted | Se |
|---------|------------------------|--|-----|----------------------|----------------------|---------------------|-----------------------|----|
| 122 | 1206853F | National Security Space Launch Program (SPACE) - EMD | 05 | 381,877 | 443,035 | | 443,035 | U |
| | | System Development & Demonstration | | 4,407,341 | 5,453,523 | | 5,453,523 | |
| 123 | 0604256F | Threat Simulator Development | 06 | 34,777 | 34,206 | | 34,206 | U |
| 124 | 0604759F | Major T&E Investment | 06 | 111,138 | 216,844 | | 216,844 | U |
| 125 | 0605101F | RAND Project Air Force | 06 | 33,089 | 34,614 | | 34,614 | U |
| 126 | 0605502F | Small Business Innovation Research | 06 | 663,657 | | | | U |
| 127 | 0605712F | Initial Operational Test & Evaluation | 06 | 15,523 | 18,043 | | 18,043 | U |
| 128 | 0605807F | Test and Evaluation Support | 06 | 735,688 | 692,784 | | 692,784 | U |
| 129 | 0605826F | Acq Workforce- Global Power | 06 | 216,144 | 227,824 | | 227,824 | U |
| 130 | 0605827F | Acq Workforce- Global Vig & Combat Sys | 06 | 225,854 | 256,617 | | 256,617 | U |
| 131 | 0605828F | Acq Workforce- Global Reach | 06 | 138,491 | 149,586 | | 149,586 | U |
| 132 | 0605829F | Acq Workforce- Cyber, Network, & Bus Sys | 06 | 205,643 | 226,257 | | 226,257 | U |
| 133 | 0605830F | Acq Workforce- Global Battle Mgmt | 06 | 146,852 | 165,438 | | 165,438 | U |
| 134 | 0605831F | Acq Workforce- Capability Integration | 06 | 221,676 | 220,320 | | 220,320 | U |
| 135 | 0605832F | Acq Workforce- Advanced Prgm Technology | 06 | 27,997 | 37,399 | | 37,399 | U |
| 136 | 0605833F | Acq Workforce- Nuclear Systems | 06 | 124,111 | 122,481 | | 122,481 | U |
| 137 | 0605898F | Management HQ - R&D | 06 | 9,394 | 10,364 | | 10,364 | U |

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| Line No | Program Element Number | Item | Act | FY 2020 Base | FY 2020 OCO for Base Requirements | FY 2020 OCO for Direct War and Enduring Costs | FY 2020 Total OCO | FY 2020 Total (Base + OCO) | Se |
|---------|------------------------|--|-----|--------------|-----------------------------------|---|-------------------|----------------------------|----|
| 122 | 1206853F | National Security Space Launch Program (SPACE) - EMD | 05 | 432,009 | | | | 432,009 | U |
| | | System Development & Demonstration | | 6,929,244 | | | | 6,929,244 | |
| 123 | 0604256F | Threat Simulator Development | 06 | 59,693 | | | | 59,693 | U |
| 124 | 0604759F | Major T&E Investment | 06 | 181,663 | | | | 181,663 | U |
| 125 | 0605101F | RAND Project Air Force | 06 | 35,258 | | | | 35,258 | U |
| 126 | 0605502F | Small Business Innovation Research | 06 | | | | | | U |
| 127 | 0605712F | Initial Operational Test & Evaluation | 06 | 13,793 | | | | 13,793 | U |
| 128 | 0605807F | Test and Evaluation Support | 06 | 717,895 | | | | 717,895 | U |
| 129 | 0605826F | Acq Workforce- Global Power | 06 | 258,667 | | | | 258,667 | U |
| 130 | 0605827F | Acq Workforce- Global Vig & Combat Sys | 06 | 251,992 | | | | 251,992 | U |
| 131 | 0605828F | Acq Workforce- Global Reach | 06 | 149,191 | | | | 149,191 | U |
| 132 | 0605829F | Acq Workforce- Cyber, Network, & Bus Sys | 06 | 235,360 | | | | 235,360 | U |
| 133 | 0605830F | Acq Workforce- Global Battle Mgmt | 06 | 160,196 | | | | 160,196 | U |
| 134 | 0605831F | Acq Workforce- Capability Integration | 06 | 220,255 | | | | 220,255 | U |
| 135 | 0605832F | Acq Workforce- Advanced Prgm Technology | 06 | 42,392 | | | | 42,392 | U |
| 136 | 0605833F | Acq Workforce- Nuclear Systems | 06 | 133,231 | | | | 133,231 | U |
| 137 | 0605898F | Management HQ - R&D | 06 | 5,590 | | | | 5,590 | U |

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19 Feb 2019

Appropriation: 3600F Research, Development, Test & Eval, AF

| Line No | Program Element Number | Item | Act | FY 2018 (Base + OCO) | FY 2019 Base Enacted | FY 2019 OCO Enacted | FY 2019 Total Enacted | S e c |
|---------|------------------------|--|-----|----------------------|----------------------|---------------------|-----------------------|-------|
| -- | ----- | ---- | --- | ----- | ----- | ----- | ----- | - |
| 138 | 0605976F | Facilities Restoration and Modernization - Test and Evaluation Support | 06 | 135,507 | 187,216 | | 187,216 | U |
| 139 | 0605978F | Facilities Sustainment - Test and Evaluation Support | 06 | 28,720 | 28,888 | | 28,888 | U |
| 140 | 0606017F | Requirements Analysis and Maturation | 06 | 106,646 | 48,070 | | 48,070 | U |
| 141 | 0606398F | Management HQ - T&E | 06 | | | | | U |
| 142 | 0308602F | ENTEPRISE INFORMATION SERVICES (EIS) | 06 | 18,980 | 20,435 | | 20,435 | U |
| 143 | 0702806F | Acquisition and Management Support | 06 | 14,706 | 12,367 | | 12,367 | U |
| 144 | 0804731F | General Skill Training | 06 | 457 | 448 | | 448 | U |
| 145 | 0909999F | Financing for Cancelled Account Adjustments | 06 | 391 | | | | U |
| 146 | 1001004F | International Activities | 06 | 4,418 | 3,998 | | 3,998 | U |
| 147 | 1206116F | Space Test and Training Range Development | 06 | 24,886 | 23,157 | | 23,157 | U |
| 148 | 1206392F | Space and Missile Center (SMC) Civilian Workforce | 06 | 175,247 | 169,912 | | 169,912 | U |
| 149 | 1206398F | Space & Missile Systems Center - MHA | 06 | 8,681 | 10,508 | | 10,508 | U |
| 150 | 1206860F | Rocket Systems Launch Program (SPACE) | 06 | 33,023 | 19,721 | | 19,721 | U |
| 151 | 1206864F | Space Test Program (STP) | 06 | 29,016 | 25,620 | | 25,620 | U |
| | | Management Support | | 3,490,712 | 2,963,117 | | 2,963,117 | |
| 152 | 0604003F | Advanced Battle Management System (ABMS) | 07 | | 27,883 | | 27,883 | U |

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Appropriation: 3600F Research, Development, Test & Eval, AF

| Line No | Program Element Number | Item | Act | FY 2020 Base | FY 2020 OCO for Base Requirements | FY 2020 OCO for Direct War and Enduring Costs | FY 2020 Total OCO | FY 2020 Total (Base + OCO) | Se |
|---------|------------------------|--|-----|--------------|-----------------------------------|---|-------------------|----------------------------|----|
| 138 | 0605976F | Facilities Restoration and Modernization - Test and Evaluation Support | 06 | 88,445 | | | | 88,445 | U |
| 139 | 0605978F | Facilities Sustainment - Test and Evaluation Support | 06 | 29,424 | | | | 29,424 | U |
| 140 | 0606017F | Requirements Analysis and Maturation | 06 | 62,715 | | | | 62,715 | U |
| 141 | 0606398F | Management HQ - T&E | 06 | 5,013 | | | | 5,013 | U |
| 142 | 0308602F | ENTEPRISE INFORMATION SERVICES (EIS) | 06 | 17,128 | | | | 17,128 | U |
| 143 | 0702806F | Acquisition and Management Support | 06 | 5,913 | | | | 5,913 | U |
| 144 | 0804731F | General Skill Training | 06 | 1,475 | | | | 1,475 | U |
| 145 | 0909999F | Financing for Cancelled Account Adjustments | 06 | | | | | | U |
| 146 | 1001004F | International Activities | 06 | 4,071 | | | | 4,071 | U |
| 147 | 1206116F | Space Test and Training Range Development | 06 | 19,942 | | | | 19,942 | U |
| 148 | 1206392F | Space and Missile Center (SMC) Civilian Workforce | 06 | 167,810 | | | | 167,810 | U |
| 149 | 1206398F | Space & Missile Systems Center - MHA | 06 | 10,170 | | | | 10,170 | U |
| 150 | 1206860F | Rocket Systems Launch Program (SPACE) | 06 | 13,192 | | | | 13,192 | U |
| 151 | 1206864F | Space Test Program (STP) | 06 | 26,097 | | | | 26,097 | U |
| | | Management Support | | 2,916,571 | | | | 2,916,571 | |
| 152 | 0604003F | Advanced Battle Management System (ABMS) | 07 | 35,611 | | | | 35,611 | U |

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| Line No | Program Element Number | Item | Act | FY 2018 (Base + OCO) | FY 2019 Base Enacted | FY 2019 OCO Enacted | FY 2019 Total Enacted | Se |
|---------|------------------------|---|-----|----------------------|----------------------|---------------------|-----------------------|----|
| -- | ----- | ---- | --- | ----- | ----- | ----- | ----- | - |
| 153 | 0604222F | Nuclear Weapons Support | 07 | 26,672 | | | | U |
| 154 | 0604233F | Specialized Undergraduate Flight Training | 07 | 6,269 | 11,344 | | 11,344 | U |
| 155 | 0604445F | Wide Area Surveillance | 07 | 37,750 | | | | U |
| 156 | 0604776F | Deployment & Distribution Enterprise R&D | 07 | | | | | U |
| 157 | 0604840F | F-35 C2D2 | 07 | | | | | U |
| 158 | 0605018F | AF Integrated Personnel and Pay System (AF-IPPS) | 07 | 17,298 | 41,058 | | 41,058 | U |
| 159 | 0605024F | Anti-Tamper Technology Executive Agency | 07 | 37,304 | 32,770 | | 32,770 | U |
| 160 | 0605117F | Foreign Materiel Acquisition and Exploitation | 07 | 66,653 | 68,368 | | 68,368 | U |
| 161 | 0605278F | HC/MC-130 Recap RDT&E | 07 | 30,784 | 16,174 | | 16,174 | U |
| 162 | 0606018F | NC3 Integration | 07 | 12,382 | 19,312 | | 19,312 | U |
| 163 | 0606942F | Assessments and Evaluations Cyber Vulnerabilities | 07 | | 87,800 | | 87,800 | U |
| 164 | 0101113F | B-52 Squadrons | 07 | 107,936 | 291,264 | 34,000 | 325,264 | U |
| 165 | 0101122F | Air-Launched Cruise Missile (ALCM) | 07 | 446 | 5,955 | | 5,955 | U |
| 166 | 0101126F | B-1B Squadrons | 07 | 60,367 | 60,295 | | 60,295 | U |
| 167 | 0101127F | B-2 Squadrons | 07 | 89,781 | 105,508 | | 105,508 | U |
| 168 | 0101213F | Minuteman Squadrons | 07 | 204,208 | 154,733 | | 154,733 | U |

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Appropriation: 3600F Research, Development, Test & Eval, AF

| Line No | Program Element Number | Item | Act | FY 2020 Base | FY 2020 OCO for Base Requirements | FY 2020 OCO for Direct War and Enduring Costs | FY 2020 Total OCO | FY 2020 Total (Base + OCO) | Se |
|---------|------------------------|---|-----|--------------|-----------------------------------|---|-------------------|----------------------------|----|
| 153 | 0604222F | Nuclear Weapons Support | 07 | | | | | | U |
| 154 | 0604233F | Specialized Undergraduate Flight Training | 07 | 2,584 | | | | 2,584 | U |
| 155 | 0604445F | Wide Area Surveillance | 07 | | | | | | U |
| 156 | 0604776F | Deployment & Distribution Enterprise R&D | 07 | 903 | | | | 903 | U |
| 157 | 0604840F | F-35 C2D2 | 07 | 694,455 | | | | 694,455 | U |
| 158 | 0605018F | AF Integrated Personnel and Pay System (AF-IPPS) | 07 | 40,567 | | | | 40,567 | U |
| 159 | 0605024F | Anti-Tamper Technology Executive Agency | 07 | 47,193 | | | | 47,193 | U |
| 160 | 0605117F | Foreign Materiel Acquisition and Exploitation | 07 | 70,083 | | | | 70,083 | U |
| 161 | 0605278F | HC/MC-130 Recap RDT&E | 07 | 17,218 | | | | 17,218 | U |
| 162 | 0606018F | NC3 Integration | 07 | 25,917 | | | | 25,917 | U |
| 163 | 0606942F | Assessments and Evaluations Cyber Vulnerabilities | 07 | | | | | | U |
| 164 | 0101113F | B-52 Squadrons | 07 | 325,974 | | | | 325,974 | U |
| 165 | 0101122F | Air-Launched Cruise Missile (ALCM) | 07 | 10,217 | | | | 10,217 | U |
| 166 | 0101126F | B-1B Squadrons | 07 | 1,000 | | | | 1,000 | U |
| 167 | 0101127F | B-2 Squadrons | 07 | 97,276 | | | | 97,276 | U |
| 168 | 0101213F | Minuteman Squadrons | 07 | 128,961 | | | | 128,961 | U |

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| Line No | Program Element Number | Item | Act | FY 2018 (Base + OCO) | FY 2019 Base Enacted | FY 2019 OCO Enacted | FY 2019 Total Enacted | S e c |
|---------|------------------------|---|-----|-------------------------|-------------------------|------------------------|--------------------------|-------------|
| -- | ----- | ---- | --- | ----- | ----- | ----- | ----- | - |
| 169 | 0101313F | Integrated Strategic Planning and Analysis Network (ISPAN) - USSTRATCOM | 07 | 24,898 | | | | U |
| 170 | 0101316F | Worldwide Joint Strategic Communications | 07 | 12,868 | 18,442 | | 18,442 | U |
| 171 | 0101324F | Integrated Strategic Planning & Analysis Network | 07 | 10,757 | 22,833 | | 22,833 | U |
| 172 | 0101328F | ICBM Reentry Vehicles | 07 | | 14,167 | | 14,167 | U |
| 174 | 0102110F | UH-1N Replacement Program | 07 | 188,259 | 258,022 | | 258,022 | U |
| 175 | 0102326F | Region/Sector Operation Control Center Modernization Program | 07 | 3,766 | 6,112 | | 6,112 | U |
| 176 | 0205219F | MQ-9 UAV | 07 | 184,353 | 104,345 | 4,500 | 108,845 | U |
| 177 | 0205671F | Joint Counter RCIED Electronic Warfare | 07 | | | 4,000 | 4,000 | U |
| 178 | 0207131F | A-10 Squadrons | 07 | 17,459 | 26,738 | 1,000 | 27,738 | U |
| 179 | 0207133F | F-16 Squadrons | 07 | 250,264 | 185,864 | | 185,864 | U |
| 180 | 0207134F | F-15E Squadrons | 07 | 308,218 | 203,183 | | 203,183 | U |
| 181 | 0207136F | Manned Destructive Suppression | 07 | 11,735 | 15,238 | | 15,238 | U |
| 182 | 0207138F | F-22A Squadrons | 07 | 584,004 | 584,743 | | 584,743 | U |
| 183 | 0207142F | F-35 Squadrons | 07 | 325,224 | 503,928 | | 503,928 | U |
| 184 | 0207161F | Tactical AIM Missiles | 07 | 36,303 | 37,230 | | 37,230 | U |
| 185 | 0207163F | Advanced Medium Range Air-to-Air Missile (AMRAAM) | 07 | 51,374 | 57,293 | | 57,293 | U |
| 186 | 0207227F | Combat Rescue - Pararescue | 07 | 685 | 647 | | 647 | U |

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| Line No | Program Element Number | Item | Act | FY 2020 Base | FY 2020 OCO for Base Requirements | FY 2020 OCO for Direct War and Enduring Costs | FY 2020 Total OCO | FY 2020 Total (Base + OCO) | See c |
|---------|------------------------|---|-----|--------------|-----------------------------------|---|-------------------|----------------------------|-------|
| 169 | 0101313F | Integrated Strategic Planning and Analysis Network (ISPAN) - USSTRATCOM | 07 | | | | | | U |
| 170 | 0101316F | Worldwide Joint Strategic Communications | 07 | 18,177 | | | | 18,177 | U |
| 171 | 0101324F | Integrated Strategic Planning & Analysis Network | 07 | 24,261 | | | | 24,261 | U |
| 172 | 0101328F | ICBM Reentry Vehicles | 07 | 75,571 | | | | 75,571 | U |
| 174 | 0102110F | UH-1N Replacement Program | 07 | 170,975 | | | | 170,975 | U |
| 175 | 0102326F | Region/Sector Operation Control Center Modernization Program | 07 | | | | | | U |
| 176 | 0205219F | MQ-9 UAV | 07 | 154,996 | | | | 154,996 | U |
| 177 | 0205671F | Joint Counter RCIED Electronic Warfare | 07 | | | 4,000 | 4,000 | 4,000 | U |
| 178 | 0207131F | A-10 Squadrons | 07 | 36,816 | | | | 36,816 | U |
| 179 | 0207133F | F-16 Squadrons | 07 | 193,013 | | | | 193,013 | U |
| 180 | 0207134F | F-15E Squadrons | 07 | 336,079 | | | | 336,079 | U |
| 181 | 0207136F | Manned Destructive Suppression | 07 | 15,521 | | | | 15,521 | U |
| 182 | 0207138F | F-22A Squadrons | 07 | 496,298 | | | | 496,298 | U |
| 183 | 0207142F | F-35 Squadrons | 07 | 99,943 | | | | 99,943 | U |
| 184 | 0207161F | Tactical AIM Missiles | 07 | 10,314 | | | | 10,314 | U |
| 185 | 0207163F | Advanced Medium Range Air-to-Air Missile (AMRAAM) | 07 | 55,384 | | | | 55,384 | U |
| 186 | 0207227F | Combat Rescue - Pararescue | 07 | 281 | | | | 281 | U |

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Appropriation: 3600F Research, Development, Test & Eval, AF

| Line No | Program Element Number | Item | Act | FY 2018 (Base + OCO) | FY 2019 Base Enacted | FY 2019 OCO Enacted | FY 2019 Total Enacted | S e c |
|---------|------------------------|---|-----|-------------------------|-------------------------|------------------------|--------------------------|-------------|
| -- | ----- | ---- | --- | ----- | ----- | ----- | ----- | - |
| 187 | 0207247F | AF TENCAP | 07 | | | | | U |
| 188 | 0207249F | Precision Attack Systems Procurement | 07 | 1,651 | 14,891 | | 14,891 | U |
| 189 | 0207253F | Compass Call | 07 | 34,240 | 43,901 | | 43,901 | U |
| 190 | 0207268F | Aircraft Engine Component Improvement Program | 07 | 105,664 | 121,203 | | 121,203 | U |
| 191 | 0207325F | Joint Air-to-Surface Standoff Missile (JASSM) | 07 | 29,436 | 42,472 | | 42,472 | U |
| 192 | 0207410F | Air & Space Operations Center (AOC) | 07 | 86,456 | 104,954 | | 104,954 | U |
| 193 | 0207412F | Control and Reporting Center (CRC) | 07 | 2,374 | 6,413 | | 6,413 | U |
| 194 | 0207417F | Airborne Warning and Control System (AWACS) | 07 | 118,702 | 112,280 | | 112,280 | U |
| 195 | 0207418F | Tactical Airborne Control Systems | 07 | 3,522 | 2,659 | | 2,659 | U |
| 197 | 0207431F | Combat Air Intelligence System Activities | 07 | 15,821 | 10,316 | | 10,316 | U |
| 198 | 0207444F | Tactical Air Control Party-Mod | 07 | 10,623 | 6,149 | | 6,149 | U |
| 199 | 0207448F | C2ISR Tactical Data Link | 07 | 1,754 | 538 | | 538 | U |
| 200 | 0207452F | DCAPES | 07 | 12,423 | 13,248 | | 13,248 | U |
| 201 | 0207573F | National Technical Nuclear Forensics | 07 | 2,307 | 1,788 | | 1,788 | U |
| 202 | 0207590F | Seek Eagle | 07 | 25,304 | 24,699 | | 24,699 | U |
| 203 | 0207601F | USAF Modeling and Simulation | 07 | 9,803 | 17,078 | | 17,078 | U |
| 204 | 0207605F | Wargaming and Simulation Centers | 07 | 12,369 | 6,141 | | 6,141 | U |
| 205 | 0207610F | Battlefield Abn Comm Node (BACN) | 07 | | | 42,349 | 42,349 | U |

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| Line No | Program Element Number | Item | Act | FY 2020 Base | FY 2020 OCO for Base Requirements | FY 2020 OCO for Direct War and Enduring Costs | FY 2020 Total OCO | FY 2020 Total (Base + OCO) | Se |
|---------|------------------------|---|-----|--------------|-----------------------------------|---|-------------------|----------------------------|----|
| 187 | 0207247F | AF TENCAP | 07 | 21,365 | | | | 21,365 | U |
| 188 | 0207249F | Precision Attack Systems Procurement | 07 | 10,696 | | | | 10,696 | U |
| 189 | 0207253F | Compass Call | 07 | 15,888 | | | | 15,888 | U |
| 190 | 0207268F | Aircraft Engine Component Improvement Program | 07 | 112,505 | | | | 112,505 | U |
| 191 | 0207325F | Joint Air-to-Surface Standoff Missile (JASSM) | 07 | 78,498 | | | | 78,498 | U |
| 192 | 0207410F | Air & Space Operations Center (AOC) | 07 | 114,864 | | | | 114,864 | U |
| 193 | 0207412F | Control and Reporting Center (CRC) | 07 | 8,109 | | | | 8,109 | U |
| 194 | 0207417F | Airborne Warning and Control System (AWACS) | 07 | 67,996 | | | | 67,996 | U |
| 195 | 0207418F | Tactical Airborne Control Systems | 07 | 2,462 | | | | 2,462 | U |
| 197 | 0207431F | Combat Air Intelligence System Activities | 07 | 13,668 | | | | 13,668 | U |
| 198 | 0207444F | Tactical Air Control Party-Mod | 07 | 6,217 | | | | 6,217 | U |
| 199 | 0207448F | C2ISR Tactical Data Link | 07 | | | | | | U |
| 200 | 0207452F | DCAPES | 07 | 19,910 | | | | 19,910 | U |
| 201 | 0207573F | National Technical Nuclear Forensics | 07 | 1,788 | | | | 1,788 | U |
| 202 | 0207590F | Seek Eagle | 07 | 28,237 | | | | 28,237 | U |
| 203 | 0207601F | USAF Modeling and Simulation | 07 | 15,725 | | | | 15,725 | U |
| 204 | 0207605F | Wargaming and Simulation Centers | 07 | 4,316 | | | | 4,316 | U |
| 205 | 0207610F | Battlefield Abn Comm Node (BACN) | 07 | 26,946 | | | | 26,946 | U |

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| Line No | Program Element Number | Item | Act | FY 2018 (Base + OCO) | FY 2019 Base Enacted | FY 2019 OCO Enacted | FY 2019 Total Enacted | Se |
|---------|------------------------|---|-----|----------------------|----------------------|---------------------|-----------------------|----|
| 206 | 0207697F | Distributed Training and Exercises | 07 | 4,046 | 3,825 | | 3,825 | U |
| 207 | 0208006F | Mission Planning Systems | 07 | 82,054 | 63,074 | | 63,074 | U |
| 208 | 0208007F | Tactical Deception | 07 | 3,623 | 6,949 | | 6,949 | U |
| 209 | 0208064F | OPERATIONAL HQ - CYBER | 07 | | | | | U |
| 210 | 0208087F | Distributed Cyber Warfare Operations | 07 | 38,241 | 40,168 | | 40,168 | U |
| 211 | 0208088F | AF Defensive Cyberspace Operations | 07 | 19,628 | 38,387 | | 38,387 | U |
| 212 | 0208097F | Joint Cyber Command and Control (JCC2) | 07 | | 13,000 | | 13,000 | U |
| 213 | 0208099F | Unified Platform (UP) | 07 | | 26,559 | | 26,559 | U |
| 217 | 0208288F | Intel Data Applications | 07 | | | 1,200 | 1,200 | U |
| 218 | 0301017F | Global Sensor Integrated on Network (GSIN) | 07 | 3,439 | 3,579 | | 3,579 | U |
| 219 | 0301025F | GeoBase | 07 | | | | | U |
| 220 | 0301112F | Nuclear Planning and Execution System (NPES) | 07 | 5,056 | 29,620 | | 29,620 | U |
| 226 | 0301401F | Air Force Space and Cyber Non-Traditional ISR for Battlespace Awareness | 07 | 3,721 | 6,633 | | 6,633 | U |
| 227 | 0302015F | E-4B National Airborne Operations Center (NAOC) | 07 | 37,481 | 57,758 | | 57,758 | U |
| 228 | 0303131F | Minimum Essential Emergency Communications Network (MEECN) | 07 | 34,466 | 64,543 | | 64,543 | U |
| 229 | 0303133F | High Frequency Radio Systems | 07 | | 51,612 | | 51,612 | U |
| 230 | 0303140F | Information Systems Security Program | 07 | 41,067 | 33,979 | | 33,979 | U |

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| Line No | Program Element Number | Item | Act | FY 2020 Base | FY 2020 OCO for Base Requirements | FY 2020 OCO for Direct War and Enduring Costs | FY 2020 Total OCO | FY 2020 Total (Base + OCO) | Se |
|---------|------------------------|---|-----|--------------|-----------------------------------|---|-------------------|----------------------------|----|
| 206 | 0207697F | Distributed Training and Exercises | 07 | 4,303 | | | | 4,303 | U |
| 207 | 0208006F | Mission Planning Systems | 07 | 71,465 | | | | 71,465 | U |
| 208 | 0208007F | Tactical Deception | 07 | 7,446 | | | | 7,446 | U |
| 209 | 0208064F | OPERATIONAL HQ - CYBER | 07 | 7,602 | | | | 7,602 | U |
| 210 | 0208087F | Distributed Cyber Warfare Operations | 07 | 35,178 | | | | 35,178 | U |
| 211 | 0208088F | AF Defensive Cyberspace Operations | 07 | 16,609 | | | | 16,609 | U |
| 212 | 0208097F | Joint Cyber Command and Control (JCC2) | 07 | 11,603 | | | | 11,603 | U |
| 213 | 0208099F | Unified Platform (UP) | 07 | 84,702 | | | | 84,702 | U |
| 217 | 0208288F | Intel Data Applications | 07 | | | 1,200 | 1,200 | 1,200 | U |
| 218 | 0301017F | Global Sensor Integrated on Network (GSIN) | 07 | | | | | | U |
| 219 | 0301025F | GeoBase | 07 | 2,723 | | | | 2,723 | U |
| 220 | 0301112F | Nuclear Planning and Execution System (NPES) | 07 | 44,190 | | | | 44,190 | U |
| 226 | 0301401F | Air Force Space and Cyber Non-Traditional ISR for Battlespace Awareness | 07 | 3,575 | | | | 3,575 | U |
| 227 | 0302015F | E-4B National Airborne Operations Center (NAOC) | 07 | 70,173 | | | | 70,173 | U |
| 228 | 0303131F | Minimum Essential Emergency Communications Network (MEECN) | 07 | 13,543 | | | | 13,543 | U |
| 229 | 0303133F | High Frequency Radio Systems | 07 | 15,881 | | | | 15,881 | U |
| 230 | 0303140F | Information Systems Security Program | 07 | 27,726 | | | | 27,726 | U |

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| Line No | Program Element Number | Item | Act | FY 2018 (Base + OCO) | FY 2019 Base Enacted | FY 2019 OCO Enacted | FY 2019 Total Enacted | Se c |
|---------|------------------------|--|-----|-------------------------|-------------------------|------------------------|--------------------------|---------|
| -- | ----- | ---- | --- | ----- | ----- | ----- | ----- | - |
| 231 | 0303141F | Global Combat Support System | 07 | 101 | | | | U |
| 232 | 0303142F | Global Force Management - Data Initiative | 07 | 1,944 | 2,170 | | 2,170 | U |
| 234 | 0304115F | Multi Domain Command and Control (MDC2) | 07 | | | | | U |
| 235 | 0304260F | Airborne SIGINT Enterprise | 07 | 116,186 | 109,873 | | 109,873 | U |
| 236 | 0304310F | Commercial Economic Analysis | 07 | 3,544 | 3,472 | | 3,472 | U |
| 239 | 0305015F | C2 Air Operations Suite - C2 Info Services | 07 | | 8,608 | | 8,608 | U |
| 240 | 0305020F | CCMD Intelligence Information Technology | 07 | 1,542 | 1,586 | | 1,586 | U |
| 241 | 0305022F | ISR Modernization & Automation Dvmt (IMAD) | 07 | | | | | U |
| 242 | 0305099F | Global Air Traffic Management (GATM) | 07 | 4,887 | 4,106 | | 4,106 | U |
| 243 | 0305111F | Weather Service | 07 | 35,689 | 31,615 | 3,000 | 34,615 | U |
| 244 | 0305114F | Air Traffic Control, Approach, and Landing System (ATCALs) | 07 | 5,791 | 13,271 | | 13,271 | U |
| 245 | 0305116F | Aerial Targets | 07 | 20,944 | 6,683 | | 6,683 | U |
| 248 | 0305128F | Security and Investigative Activities | 07 | 400 | 418 | | 418 | U |
| 249 | 0305145F | Arms Control Implementation | 07 | | 21,374 | | 21,374 | U |
| 250 | 0305146F | Defense Joint Counterintelligence Activities | 07 | 4,520 | 3,845 | | 3,845 | U |
| 252 | 0305179F | Integrated Broadcast Service (IBS) | 07 | | | | | U |

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| Line No | Program Element Number | Item | Act | FY 2020 Base | FY 2020 OCO for Base Requirements | FY 2020 OCO for Direct War and Enduring Costs | FY 2020 Total OCO | FY 2020 Total (Base + OCO) | Se |
|---------|------------------------|--|-----|--------------|-----------------------------------|---|-------------------|----------------------------|----|
| 231 | 0303141F | Global Combat Support System | 07 | | | | | | U |
| 232 | 0303142F | Global Force Management - Data Initiative | 07 | 2,210 | | | | 2,210 | U |
| 234 | 0304115F | Multi Domain Command and Control (MDC2) | 07 | 150,880 | | | | 150,880 | U |
| 235 | 0304260F | Airborne SIGINT Enterprise | 07 | 102,667 | | | | 102,667 | U |
| 236 | 0304310F | Commercial Economic Analysis | 07 | 3,431 | | | | 3,431 | U |
| 239 | 0305015F | C2 Air Operations Suite - C2 Info Services | 07 | 9,313 | | | | 9,313 | U |
| 240 | 0305020F | CCMD Intelligence Information Technology | 07 | 1,121 | | | | 1,121 | U |
| 241 | 0305022F | ISR Modernization & Automation Dvmt (IMAD) | 07 | 19,000 | | | | 19,000 | U |
| 242 | 0305099F | Global Air Traffic Management (GATM) | 07 | 4,544 | | | | 4,544 | U |
| 243 | 0305111F | Weather Service | 07 | 25,461 | | | | 25,461 | U |
| 244 | 0305114F | Air Traffic Control, Approach, and Landing System (ATCALs) | 07 | 5,651 | | | | 5,651 | U |
| 245 | 0305116F | Aerial Targets | 07 | 7,448 | | | | 7,448 | U |
| 248 | 0305128F | Security and Investigative Activities | 07 | 425 | | | | 425 | U |
| 249 | 0305145F | Arms Control Implementation | 07 | 54,546 | | | | 54,546 | U |
| 250 | 0305146F | Defense Joint Counterintelligence Activities | 07 | 6,858 | | | | 6,858 | U |
| 252 | 0305179F | Integrated Broadcast Service (IBS) | 07 | 8,728 | | | | 8,728 | U |

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|---------|------------------------|---|-----|----------------------|----------------------|---------------------|-----------------------|-----|
| --- | ----- | ---- | --- | ----- | ----- | ----- | ----- | --- |
| 253 | 0305202F | Dragon U-2 | 07 | 34,486 | 65,518 | 22,100 | 87,618 | U |
| 254 | 0305205F | Endurance Unmanned Aerial Vehicles | 07 | 40,000 | 15,000 | | 15,000 | U |
| 255 | 0305206F | Airborne Reconnaissance Systems | 07 | 19,450 | 195,334 | | 195,334 | U |
| 256 | 0305207F | Manned Reconnaissance Systems | 07 | 14,297 | 14,223 | | 14,223 | U |
| 257 | 0305208F | Distributed Common Ground/Surface Systems | 07 | 38,064 | 24,554 | 29,500 | 54,054 | U |
| 258 | 0305220F | RQ-4 UAV | 07 | 222,693 | 221,690 | | 221,690 | U |
| 259 | 0305221F | Network-Centric Collaborative Targeting | 07 | 14,837 | 14,288 | | 14,288 | U |
| 260 | 0305238F | NATO AGS | 07 | 44,729 | 51,527 | | 51,527 | U |
| 261 | 0305240F | Support to DCGS Enterprise | 07 | 26,349 | 26,579 | | 26,579 | U |
| 262 | 0305600F | International Intelligence Technology and Architectures | 07 | 9,491 | 8,464 | | 8,464 | U |
| 263 | 0305881F | Rapid Cyber Acquisition | 07 | 4,720 | 4,303 | | 4,303 | U |
| 264 | 0305984F | Personnel Recovery Command & Ctrl (PRC2) | 07 | 2,364 | 2,466 | | 2,466 | U |
| 265 | 0307577F | Intelligence Mission Data (IMD) | 07 | 8,684 | 4,117 | | 4,117 | U |
| 266 | 0401115F | C-130 Airlift Squadron | 07 | 10,219 | 105,988 | | 105,988 | U |
| 267 | 0401119F | C-5 Airlift Squadrons (IF) | 07 | 11,433 | 25,071 | | 25,071 | U |
| 268 | 0401130F | C-17 Aircraft (IF) | 07 | 21,701 | 48,299 | | 48,299 | U |
| 269 | 0401132F | C-130J Program | 07 | 24,908 | 15,409 | | 15,409 | U |
| 270 | 0401134F | Large Aircraft IR Countermeasures (LAIRCM) | 07 | 5,095 | 4,334 | | 4,334 | U |

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|---------|------------------------|---|-----|--------------|-----------------------------------|---|-------------------|----------------------------|----|
| -- | ----- | ---- | --- | ----- | ----- | ----- | ----- | ----- | - |
| 253 | 0305202F | Dragon U-2 | 07 | 38,939 | | | | 38,939 | U |
| 254 | 0305205F | Endurance Unmanned Aerial Vehicles | 07 | | | | | | U |
| 255 | 0305206F | Airborne Reconnaissance Systems | 07 | 122,909 | | | | 122,909 | U |
| 256 | 0305207F | Manned Reconnaissance Systems | 07 | 11,787 | | | | 11,787 | U |
| 257 | 0305208F | Distributed Common Ground/Surface Systems | 07 | 25,009 | | | | 25,009 | U |
| 258 | 0305220F | RQ-4 UAV | 07 | 191,733 | | | | 191,733 | U |
| 259 | 0305221F | Network-Centric Collaborative Targeting | 07 | 10,757 | | | | 10,757 | U |
| 260 | 0305238F | NATO AGS | 07 | 32,567 | | | | 32,567 | U |
| 261 | 0305240F | Support to DCGS Enterprise | 07 | 37,774 | | | | 37,774 | U |
| 262 | 0305600F | International Intelligence Technology and Architectures | 07 | 13,515 | | | | 13,515 | U |
| 263 | 0305881F | Rapid Cyber Acquisition | 07 | 4,383 | | | | 4,383 | U |
| 264 | 0305984F | Personnel Recovery Command & Ctrl (PRC2) | 07 | 2,133 | | | | 2,133 | U |
| 265 | 0307577F | Intelligence Mission Data (IMD) | 07 | 8,614 | | | | 8,614 | U |
| 266 | 0401115F | C-130 Airlift Squadron | 07 | 140,425 | | | | 140,425 | U |
| 267 | 0401119F | C-5 Airlift Squadrons (IF) | 07 | 10,223 | | | | 10,223 | U |
| 268 | 0401130F | C-17 Aircraft (IF) | 07 | 25,101 | | | | 25,101 | U |
| 269 | 0401132F | C-130J Program | 07 | 8,640 | | | | 8,640 | U |
| 270 | 0401134F | Large Aircraft IR Countermeasures (LAIRCM) | 07 | 5,424 | | | | 5,424 | U |

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|---------|------------------------|--|-----|----------------------|----------------------|---------------------|-----------------------|----|
| 271 | 0401218F | KC-135s | 07 | 8,645 | 3,493 | | 3,493 | U |
| 272 | 0401219F | KC-10s | 07 | 9,181 | 6,569 | | 6,569 | U |
| 273 | 0401314F | Operational Support Airlift | 07 | 5,196 | 3,172 | | 3,172 | U |
| 274 | 0401318F | CV-22 | 07 | 17,744 | 16,502 | | 16,502 | U |
| 275 | 0401840F | AMC Command and Control System | 07 | 3,394 | 1,688 | | 1,688 | U |
| 276 | 0408011F | Special Tactics / Combat Control | 07 | 7,726 | 2,433 | | 2,433 | U |
| 277 | 0702207F | Depot Maintenance (Non-IF) | 07 | 1,517 | 1,897 | | 1,897 | U |
| 278 | 0708055F | Maintenance, Repair & Overhaul System | 07 | 28,726 | 50,933 | | 50,933 | U |
| 279 | 0708610F | Logistics Information Technology (LOGIT) | 07 | 23,332 | 13,479 | | 13,479 | U |
| 280 | 0708611F | Support Systems Development | 07 | 11,362 | 4,497 | | 4,497 | U |
| 281 | 0804743F | Other Flight Training | 07 | 1,998 | 2,022 | | 2,022 | U |
| 282 | 0808716F | Other Personnel Activities | 07 | 103 | 108 | | 108 | U |
| 283 | 0901202F | Joint Personnel Recovery Agency | 07 | 1,933 | 2,023 | | 2,023 | U |
| 284 | 0901218F | Civilian Compensation Program | 07 | 2,905 | 3,561 | | 3,561 | U |
| 285 | 0901220F | Personnel Administration | 07 | 5,404 | 4,258 | | 4,258 | U |
| 286 | 0901226F | Air Force Studies and Analysis Agency | 07 | 1,506 | 1,418 | | 1,418 | U |
| 287 | 0901538F | Financial Management Information Systems Development | 07 | 87,802 | 93,418 | | 93,418 | U |
| 288 | 0901554F | Defense Enterprise Acntng and Mgt Sys (DEAMS) | 07 | | | | | U |

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|---------|------------------------|--|-----|--------------|-----------------------------------|---|-------------------|----------------------------|----|
| -- | ----- | ---- | --- | ----- | ----- | ----- | ----- | ----- | - |
| 271 | 0401218F | KC-135s | 07 | | | | | | U |
| 272 | 0401219F | KC-10s | 07 | 20 | | | | 20 | U |
| 273 | 0401314F | Operational Support Airlift | 07 | | | | | | U |
| 274 | 0401318F | CV-22 | 07 | 17,906 | | | | 17,906 | U |
| 275 | 0401840F | AMC Command and Control System | 07 | | | | | | U |
| 276 | 0408011F | Special Tactics / Combat Control | 07 | 3,629 | | | | 3,629 | U |
| 277 | 0702207F | Depot Maintenance (Non-IF) | 07 | 1,890 | | | | 1,890 | U |
| 278 | 0708055F | Maintenance, Repair & Overhaul System | 07 | 10,311 | | | | 10,311 | U |
| 279 | 0708610F | Logistics Information Technology (LOGIT) | 07 | 16,065 | | | | 16,065 | U |
| 280 | 0708611F | Support Systems Development | 07 | 539 | | | | 539 | U |
| 281 | 0804743F | Other Flight Training | 07 | 2,057 | | | | 2,057 | U |
| 282 | 0808716F | Other Personnel Activities | 07 | 10 | | | | 10 | U |
| 283 | 0901202F | Joint Personnel Recovery Agency | 07 | 2,060 | | | | 2,060 | U |
| 284 | 0901218F | Civilian Compensation Program | 07 | 3,809 | | | | 3,809 | U |
| 285 | 0901220F | Personnel Administration | 07 | 6,476 | | | | 6,476 | U |
| 286 | 0901226F | Air Force Studies and Analysis Agency | 07 | 1,443 | | | | 1,443 | U |
| 287 | 0901538F | Financial Management Information Systems Development | 07 | 9,323 | | | | 9,323 | U |
| 288 | 0901554F | Defense Enterprise Acntng and Mgt Sys (DEAMS) | 07 | 46,789 | | | | 46,789 | U |

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|---------|------------------------|--|-----|----------------------|----------------------|---------------------|-----------------------|----|
| 289 | 1201017F | Global Sensor Integrated on Network (GSIN) | 07 | | | | | U |
| 290 | 1201921F | Service Support to STRATCOM - Space Activities | 07 | 13,769 | 14,161 | | 14,161 | U |
| 291 | 1202140F | Service Support to SPACECOM Activities | 07 | | | | | U |
| 292 | 1202247F | AF TENCAP | 07 | 80,726 | 26,986 | 5,000 | 31,986 | U |
| 293 | 1203001F | Family of Advanced BLoS Terminals (FAB-T) | 07 | 26,262 | 60,168 | | 60,168 | U |
| 294 | 1203110F | Satellite Control Network (SPACE) | 07 | 18,133 | 26,440 | | 26,440 | U |
| 296 | 1203165F | NAVSTAR Global Positioning System (Space and Control Segments) | 07 | 7,681 | 8,937 | | 8,937 | U |
| 297 | 1203173F | Space and Missile Test and Evaluation Center | 07 | 43,715 | 79,935 | | 79,935 | U |
| 298 | 1203174F | Space Innovation, Integration and Rapid Technology Development | 07 | 9,081 | 21,019 | | 21,019 | U |
| 299 | 1203179F | Integrated Broadcast Service (IBS) | 07 | 8,747 | 8,568 | | 8,568 | U |
| 300 | 1203182F | Spacelift Range System (SPACE) | 07 | 20,035 | 20,168 | | 20,168 | U |
| 301 | 1203265F | GPS III Space Segment | 07 | 233,043 | 141,892 | | 141,892 | U |
| 302 | 1203400F | Space Superiority Intelligence | 07 | 10,691 | 16,278 | | 16,278 | U |
| 303 | 1203614F | JSpOC Mission System | 07 | 125,191 | 70,383 | | 70,383 | U |
| 304 | 1203620F | National Space Defense Center | 07 | 18,052 | 55,309 | | 55,309 | U |
| 305 | 1203699F | Shared Early Warning (SEW) | 07 | 1,327 | | | | U |
| 306 | 1203873F | Ballistic Missile Defense Radars | 07 | | | | | U |

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|---------|------------------------|--|-----|--------------|-----------------------------------|---|-------------------|----------------------------|----|
| 289 | 1201017F | Global Sensor Integrated on Network (GSIN) | 07 | 3,647 | | | | 3,647 | U |
| 290 | 1201921F | Service Support to STRATCOM - Space Activities | 07 | 988 | | | | 988 | U |
| 291 | 1202140F | Service Support to SPACECOM Activities | 07 | 11,863 | | | | 11,863 | U |
| 292 | 1202247F | AF TENCAP | 07 | | | | | | U |
| 293 | 1203001F | Family of Advanced BLoS Terminals (FAB-T) | 07 | 197,388 | | | | 197,388 | U |
| 294 | 1203110F | Satellite Control Network (SPACE) | 07 | 61,891 | | | | 61,891 | U |
| 296 | 1203165F | NAVSTAR Global Positioning System (Space and Control Segments) | 07 | | | | | | U |
| 297 | 1203173F | Space and Missile Test and Evaluation Center | 07 | 4,566 | | | | 4,566 | U |
| 298 | 1203174F | Space Innovation, Integration and Rapid Technology Development | 07 | 43,292 | | | | 43,292 | U |
| 299 | 1203179F | Integrated Broadcast Service (IBS) | 07 | | | | | | U |
| 300 | 1203182F | Spacelift Range System (SPACE) | 07 | 10,837 | | | | 10,837 | U |
| 301 | 1203265F | GPS III Space Segment | 07 | 42,440 | | | | 42,440 | U |
| 302 | 1203400F | Space Superiority Intelligence | 07 | 14,428 | | | | 14,428 | U |
| 303 | 1203614F | JSpOC Mission System | 07 | 72,762 | | | | 72,762 | U |
| 304 | 1203620F | National Space Defense Center | 07 | 2,653 | | | | 2,653 | U |
| 305 | 1203699F | Shared Early Warning (SEW) | 07 | | | | | | U |
| 306 | 1203873F | Ballistic Missile Defense Radars | 07 | 15,881 | | | | 15,881 | U |

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|--|------------------------|--|-----|-------------------------|-------------------------|------------------------|--------------------------|-------------|
| -- | ----- | ---- | --- | ----- | ----- | ----- | ----- | - |
| 307 | 1203906F | NCMC - TW/AA System | 07 | 5,000 | | | | U |
| 308 | 1203913F | NUDET Detection System (SPACE) | 07 | 31,304 | 19,778 | | 19,778 | U |
| 309 | 1203940F | Space Situation Awareness Operations | 07 | 86,173 | 19,572 | | 19,572 | U |
| 310 | 1206423F | Global Positioning System III - Operational Control Segment | 07 | 492,986 | 509,258 | | 509,258 | U |
| 311 | 1206770F | Enterprise Ground Services | 07 | | | | | U |
| 9999 | 9999999999 | Classified Programs | | 16,789,633 | 16,859,524 | 161,790 | 17,021,314 | U |
| | | Operational Systems Development | | 22,442,379 | 23,153,697 | 308,439 | 23,462,136 | |
| Total Research, Development, Test & Eval, AF | | | | 38,077,597 | 41,166,683 | 321,934 | 41,488,617 | |

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|--|----------------|---|-----|--------------|-----------------------------------|---|-------------------|----------------------------|-----|
| 307 | 1203906F | NCCM - TW/AA System | 07 | | | | | | U |
| 308 | 1203913F | NUDET Detection System (SPACE) | 07 | 49,300 | | | | 49,300 | U |
| 309 | 1203940F | Space Situation Awareness Operations | 07 | 17,834 | | | | 17,834 | U |
| 310 | 1206423F | Global Positioning System III - Operational Control Segment | 07 | 445,302 | | | | 445,302 | U |
| 311 | 1206770F | Enterprise Ground Services | 07 | 138,870 | | | | 138,870 | U |
| 9999 | 9999999999 | Classified Programs | | 18,029,506 | 322,000 | 78,713 | 400,713 | 18,430,219 | U |
| | | Operational Systems Development | | 24,529,488 | | 83,913 | 405,913 | 24,935,401 | |
| Total Research, Development, Test & Eval, AF | | | | 45,616,122 | | 128,248 | 450,248 | 46,066,370 | |

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| Sustainment Science and Technology (S&T) | 0603199F | 18 | 03..... | Volume 1 - 251 |
| Tactical AIM Missiles | 0207161F | 184 | 07..... | Volume 3a - 487 |
| Tactical Air Control Party-Mod | 0207444F | 198 | 07..... | Volume 3a - 635 |
| Tactical Airborne Control Systems | 0207418F | 195 | 07..... | Volume 3a - 609 |
| Tactical Data Networks Enterprise | 0604281F | 77 | 05..... | Volume 2 - 543 |
| Tactical Deception | 0208007F | 208 | 07..... | Volume 3a - 765 |
| Tech Transition Program | 0604858F | 48 | 04..... | Volume 2 - 247 |
| Technology Transfer | 0604317F | 44 | 04..... | Volume 2 - 169 |
| Test and Evaluation Support | 0605807F | 128 | 06..... | Volume 2 - 1073 |
| Threat Simulator Development | 0604256F | 123 | 06..... | Volume 2 - 1037 |
| Three Dimensional Long-Range Radar (3DELRR) | 0207455F | 52 | 04..... | Volume 2 - 309 |
| UH-1N Replacement Program | 0102110F | 174 | 07..... | Volume 3a - 331 |
| USAF Modeling and Simulation | 0207601F | 203 | 07..... | Volume 3a - 689 |
| Unified Platform (UP) | 0208099F | 53 | 04..... | Volume 2 - 319 |

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| Program Element Title | Program Element Number | Line # | BA | Page |
|--|-------------------------------|---------------|-----------|-----------------|
| Unified Platform (UP) | 0208099F | 213 | 07..... | Volume 3a - 841 |
| University Research Initiatives | 0601103F | 2 | 01..... | Volume 1 - 17 |
| VC-25B | 0401319F | 107 | 05..... | Volume 2 - 869 |
| Wargaming and Simulation Centers | 0207605F | 204 | 07..... | Volume 3a - 703 |
| Weather Service | 0305111F | 243 | 07..... | Volume 3b - 197 |
| Weather System Follow-on | 1206422F | 63 | 04..... | Volume 2 - 409 |
| Weather System Follow-on | 1206422F | 113 | 05..... | Volume 2 - 925 |
| Wide Area Surveillance | 0604445F | 155 | 07..... | Volume 3a - 39 |
| Wideband Global SATCOM (SPACE) | 1206433F | 118 | 05..... | Volume 2 - 971 |
| Worldwide Joint Strategic Communications | 0101316F | 170 | 07..... | Volume 3a - 307 |

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The following Program Elements are not providing RDT&E exhibits due to classification:

0101815F ADVANCED STRATEGIC PROGRAM
0207424F EVALUATION AND ANALYSIS PROGRAM
0208161F SPECIAL EVALUATION SYSTEM
0208162F ADVANCED TECHNOLOGY PROGRAM
0301310F NATIONAL AIR INTELLIGENCE CENTER
0301314F COBRA BALL
0301315F MISSILE AND SPACE TECHICAL COLLECTION
0301324F FOREST GREEN
0301386F GDIP COLLECTION MANAGEMENT
0304111F SPECIAL ACTIVITES
0304311F SELECTED ACTIVITIES
0304348F ADVANCED GEOSPATIAL INTELLIGENCE (AGI)
0305124F SPECIAL APPLICATIONS PROGRAM
0305127F FOREIGN COUNTERINTELLIGENCE ACTIVITES
0305159F DEFENSE RECONNAISSANCE SUPPORT ACTIVITIES
0305172F COMBINED ADVANCED APPLICATIONS
0604446F WIDE AREA SURVEILLANCE - SP
0605798F ANALYSIS SUPPORT GROUP

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0603260F / <i>Intelligence Advanced Development</i> |
|--|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 7.652 | 5.568 | 5.672 | 0.000 | 5.672 | 5.770 | 5.891 | 5.997 | 6.104 | Continuing | Continuing |
| 64536A: <i>INTELLIGENCE EXPLOITATION TOOLS (IET)</i> | - | 6.488 | 4.421 | 4.503 | 0.000 | 4.503 | 4.580 | 4.676 | 4.760 | 4.845 | Continuing | Continuing |
| 64537A: <i>INTELLIGENCE ANALYSIS CAPABILITIES (IAC)</i> | - | 1.164 | 1.147 | 1.169 | 0.000 | 1.169 | 1.190 | 1.215 | 1.237 | 1.259 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

Intelligence Advanced Development (IAD) develops and demonstrates technology required to support warfighter needs for timely all source intelligence information. IAD supports global awareness, consistent battlespace knowledge, precision information, and the execution of time critical missions. IAD focuses on enhancing defense intelligence capabilities through exploration and development of innovative tools including data analytics for mining and exploitation, machine-learning, and software automation. IAD projects provide improved on-time information to the warfighter using new and existing data sources, streamlining data analysis, thus reducing the footprint required, and enhancing performance. These support the Anti-Access/Area Denial (A2/AD) Contested/Congested Degraded Operations (CDO) problem set. The Air Force Research Lab, Rome Research Site, Information Intelligence Systems and Analysis Division (AFRL/RIE), works directly with users, employing evolutionary approaches and integrating finished modules directly into the field. The programs are oriented toward specific shortfalls and deficiencies as documented by the Major Commands (MAJCOMS), Unified Commands, and intelligence organizations in their mission and functional area plans. This PE expedites technology transition from the laboratory to operational users via rapid prototyping. It is focused on technology insertion to correct AF intelligence deficiencies at the tactical and operational levels. The PE bridges the transition of new technologies from Advance Technology Demonstrations (ATDs) and Integrated Technology Thrust Programs (ITTPs) into current/new systems, and supports the associated Defense Technology Objectives (DTOs). IAD may also reallocate existing resources to support out-of-cycle new/updated warfighter requirements.

Requirements for this PE are identified and prioritized by Air Combat Command (ACC). Development of new/improved capabilities to meet the requirements are managed by AFRL/RIE. Prototype products, usually in the form of software, are provided to users in incremental capability spirals for operational environment evaluation.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver Intelligence Advanced Development capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, and 0605898F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0603260F / <i>Intelligence Advanced Development</i> |
|--|--|

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 5.652 | 5.568 | 5.672 | 0.000 | 5.672 |
| Current President's Budget | 7.652 | 5.568 | 5.672 | 0.000 | 5.672 |
| Total Adjustments | 2.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 2.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 4 | | | | | R-1 Program Element (Number/Name) PE 0603260F / <i>Intelligence Advanced Development</i> | | | | Project (Number/Name) 64536A / <i>INTELLIGENCE EXPLOITATION TOOLS (IET)</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 64536A: <i>INTELLIGENCE EXPLOITATION TOOLS (IET)</i> | - | 6.488 | 4.421 | 4.503 | 0.000 | 4.503 | 4.580 | 4.676 | 4.760 | 4.845 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

The mission is to develop prototypes which encompass several areas of intelligence exploitation including the advancement of all source correlation and fusion for the intelligence analyst. Projects include development of innovative data analytics, machine-learning, and automated software tools. The intent is to enhance the overall situational awareness for Air Force, DoD, and Coalition groups which have requirements to correlate various sources of intelligence information, including Communications Intelligence (COMINT), Electronics Intelligence (ELINT), Imagery Intelligence (IMINT), Geospatial Intelligence (GEOINT), Measurement and Signature Intelligence (MASINT), Signals Intelligence (SIGINT), Publicly Available Information (PAI) and others, in a timely manner. IET may reallocate existing resources to support out-of-cycle new/updated warfighter requirements.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| Title: Intelligence Exploitation Tools (IET) | 6.488 | 4.421 | 4.503 |
| <p>Description: IET addresses the accurate and timely interpretation of various Intelligence data sources (such as digital imagery, video, documents, signals) by developing and evaluating methods to index, exploit, and manipulate disparate data products using analytics, machine-learning, and software automation. This provides the analyst with the ability to rapidly search and fuse multiple intelligence sources for improved situational awareness and to better detect anomalies. Cross domain tools enable data exploitation at multiple classification levels. In addition, methods to improve analysis of current and future foreign weapon systems are developed. IET provides enhanced warning and accuracy to allow national and military authorities a greater range of options to avert, diminish or control a crisis.</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none"> - Completing development of software focused on improving the way computers and application services supports intelligence analysts through the use of cognitive systems - Completing the development of automated methods that aid in the systematic, continuous, and comprehensive assessment of technical topic, concepts and emergence using information found in the published scientific, technical and patent literature, message traffic, gray literature, and conference papers - Completing the enabling of Distributed Common Ground Station (DCGS) enterprise support of high-altitude SIGINT missions and execution on NSANet | | | |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603260F / <i>Intelligence Advanced Development</i> | Project (Number/Name) 64536A / <i>INTELLIGENCE EXPLOITATION TOOLS (IET)</i> | | |
| B. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| <ul style="list-style-type: none"> - Completing development of a software capability to exploit and fuse Publicly Available Information with DCGS related sources - Completing the development of a Feature Extractor to assist automation of Tech ELINT screening - Continuing development and integration of space based modeling capabilities into the Integrated Many on Many (IMOM) mission planning tool - Completing the implementation of operational metadata capability for DCGS SIGINT collection systems - Continuing user evaluations and prototype releases evaluations and prototype releases <p>FY 2020 Plans:</p> <ul style="list-style-type: none"> - Will continue development and integration of space based modeling capabilities into the IMOM mission planning tool - Will continue implementation of operational metadata capability for DCGS SIGINT collection systems - Will continue Mobile Command, Control, Communication, and Computer (Mobile C4) database and visualization capability for intelligence operators; integrated into National Air and Space Intelligence Center (NASIC) toolset - Will develop automated artificial intelligent systems and modeling and simulation tools for understanding and visualizing patterns of life, for detecting vulnerabilities in weapon systems, and for the analysis of targets from multi-sourced data in various threat environments - Will develop multi-INT entity resolution capabilities, utilizing cataloged repositories, which will enable analysts to apply automated machine intelligence and prediction tools to identify trends and mission statistics for SIGINT and DCGS users - Will continue user evaluations and prototype releases <p>FY 2019 to FY 2020 Increase/Decrease Statement: Slight increase reflects initial studies into utilizing artificial intelligence and modeling tools.</p> | | | | |
| Accomplishments/Planned Programs Subtotals | | 6.488 | 4.421 | 4.503 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603260F / <i>Intelligence Advanced Development</i> | Project (Number/Name) 64536A / <i>INTELLIGENCE EXPLOITATION TOOLS (IET)</i> |

C. Other Program Funding Summary (\$ in Millions)
N/A

Remarks

D. Acquisition Strategy

Requirements for new/improved techniques for operational employment of simulation models are identified and prioritized by ACC. Development of the new/improved capabilities to meet these requirements is managed by Air Force Research Laboratory (AFRL) Rome Research Site. Prototype products (usually software), once evaluated by the users, are transitioned from the laboratory to the operational community in spirals. All major contracts within this project are awarded after full and open competition.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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|---|-----------------------------------|---|--------------------|--|-------------------|----------------|---------------------|---------------------|--------------------|---|----------------------|-------------------------|-------------------------|---------------------------------|---------------------------------|
| Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force | | | | | | | | | | | Date: February 2019 | | | | |
| Appropriation/Budget Activity 3600 / 4 | | | | R-1 Program Element (Number/Name) PE 0603260F / Intelligence Advanced Development | | | | | | Project (Number/Name) 64536A / INTELLIGENCE EXPLOITATION TOOLS (IET) | | | | | |
| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | | | |
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | Target Value of Contract |
| Intelligence Exploitation Tools (IET) | Various | Various : Various | - | 6.073 | Jan 2018 | 4.009 | Jan 2019 | 4.090 | Jan 2020 | - | | 4.090 | Continuing | Continuing | - |
| Subtotal | | | - | 6.073 | | 4.009 | | 4.090 | | - | | 4.090 | Continuing | Continuing | N/A |
| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | | | |
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | Target Value of Contract |
| PMA | Various | AFRL - Information Directorate : Rome, NY | - | 0.415 | Oct 2017 | 0.412 | Oct 2018 | 0.413 | Oct 2019 | - | | 0.413 | Continuing | Continuing | - |
| Subtotal | | | - | 0.415 | | 0.412 | | 0.413 | | - | | 0.413 | Continuing | Continuing | N/A |
| | | | Prior Years | FY 2018 | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract | |
| Project Cost Totals | | | - | 6.488 | 4.421 | 4.503 | - | 4.503 | Continuing | Continuing | N/A | | | | |
| Remarks | | | | | | | | | | | | | | | |

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603260F / <i>Intelligence Advanced Development</i> | Project (Number/Name) 64536A / <i>INTELLIGENCE EXPLOITATION TOOLS (IET)</i> |

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
|--|--|
| IET | |
| IET Development | |
| Software to improve support to intelligence analysts through cognitive systems | |
| Automated methods for assessment of technical topics, concepts, and emergence | |
| DCGS enterprise support to high-altitude SIGINT missions | |
| Exploit and fuse Publicly Available Information with DCGS related sources | |
| Feature Extractor to assist automation in Tech ELINT | |
| Space based modeling capabilities into IMOM mission planning tool | |
| Operational metadata capability for DCGS SIGINT collection systems | |
| FY18 IET User Evaluations & Prototype Releases | |
| FY19 IET User Evaluations & Prototype Releases | |
| FY20 IET User Evaluations & Prototype Releases | |
| FY21 IET User Evaluations & Prototype Releases | |
| FY22 IET User Evaluations & Prototype Releases | |

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603260F / <i>Intelligence Advanced Development</i> | Project (Number/Name) 64536A / <i>INTELLIGENCE EXPLOITATION TOOLS (IET)</i> |
|--|--|---|

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|--|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

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|--|--|
| FY23 IET User Evaluations & Prototype Releases | |
| FY24 IET User Evaluations & Prototype Releases | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603260F / <i>Intelligence Advanced Development</i> | Project (Number/Name) 64536A / <i>INTELLIGENCE EXPLOITATION TOOLS (IET)</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>IET</i> | | | | |
| IET Development | 1 | 2018 | 4 | 2024 |
| Software to improve support to intelligence analysts through cognitive systems | 1 | 2018 | 4 | 2019 |
| Automated methods for assessment of technical topics, concepts, and emergence | 1 | 2018 | 4 | 2019 |
| DCGS enterprise support to high-altitude SIGINT missions | 1 | 2018 | 4 | 2020 |
| Exploit and fuse Publicly Available Information with DCGS related sources | 1 | 2018 | 4 | 2019 |
| Feature Extractor to assist automation in Tech ELINT | 1 | 2018 | 4 | 2019 |
| Space based modeling capabilities into IMOM mission planning tool | 1 | 2018 | 4 | 2020 |
| Operational metadata capability for DCGS SIGINT collection systems | 1 | 2018 | 4 | 2020 |
| FY18 IET User Evaluations & Prototype Releases | 1 | 2018 | 4 | 2018 |
| FY19 IET User Evaluations & Prototype Releases | 1 | 2019 | 4 | 2019 |
| FY20 IET User Evaluations & Prototype Releases | 1 | 2020 | 4 | 2020 |
| FY21 IET User Evaluations & Prototype Releases | 1 | 2021 | 4 | 2021 |
| FY22 IET User Evaluations & Prototype Releases | 1 | 2022 | 4 | 2022 |
| FY23 IET User Evaluations & Prototype Releases | 1 | 2023 | 4 | 2023 |
| FY24 IET User Evaluations & Prototype Releases | 1 | 2024 | 4 | 2024 |

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|---|--------------------|----------------|----------------|---------------------|--|----------------------|----------------|----------------|--|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 4 | | | | | R-1 Program Element (Number/Name) PE 0603260F / <i>Intelligence Advanced Development</i> | | | | Project (Number/Name) 64537A / <i>INTELLIGENCE ANALYSIS CAPABILITIES (IAC)</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 64537A: <i>INTELLIGENCE ANALYSIS CAPABILITIES (IAC)</i> | - | 1.164 | 1.147 | 1.169 | 0.000 | 1.169 | 1.190 | 1.215 | 1.237 | 1.259 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

The mission is to provide continuing development and upgrades of threat analysis capabilities to produce integrated, predictive air and space intelligence to enable military operations, force modernization decisions, and policy making. Products from IAC allow the Intelligence Analyst to accelerate and increase the accuracy of threat estimates and system descriptions to deployed operational forces. Each of the development projects within the IAC program portfolio transition technologies to the operational communities through the incremental release of upgraded versions over a period of years as development projects progress towards the final configuration. IAC may reallocate existing resources to support out-of-cycle new/ updated warfighter requirements.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| Title: Intelligence Analysis Capabilities (IAC) Development | 1.164 | 1.147 | 1.169 |
| Description: IAC develops tools and algorithms for Intelligence Analysts with the ability to produce accurate, predictive, relevant, and timely intelligence that supports client processes, operational planning, and mission execution. Methods include data analytics techniques, machine-learning, and software automation. IAC develops new and upgraded analysis, modeling and simulation tools focused on intelligence production supporting AF operational and developmental all source analysis functions. | | | |
| FY 2019 Plans: | | | |
| - Continuing development of a query class prototype system that will enable users to search large volumes of disparate multimodal and multilingual data sources; this service will be accessible for use by DoD and Intelligence Community (IC) cloud service architectures. | | | |
| - Continuing development of a prototype Modeling and Simulation tool to address the need for improved threat Integrated Air Defense System (IADS) passive detection/tracking and combat identification | | | |
| - Developing Mobile Command, Control, Communication, and Computer (Mobile C4) database and visualization capability for intelligence operators; integrated into National Air and Space Intelligence Center (NASIC) toolset | | | |
| - Developing a prototype for providing improved Electronic Warfare (EW) information to operational users by leveraging the capabilities of the modernized, national EW databases; this includes signal identification, waveform ambiguity detection and emitter descriptions across all three national EW databases | | | |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603260F / <i>Intelligence Advanced Development</i> | Project (Number/Name) 64537A / <i>INTELLIGENCE ANALYSIS CAPABILITIES (IAC)</i> | | |
| B. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| <p>- Continuing user evaluations and prototype releases.</p> <p>FY 2020 Plans:</p> <p>- Will continue development of a query class prototype system that will enable users to search large volumes of disparate multimodal and multilingual data sources; this service will be accessible for use by DoD and IC cloud service architectures</p> <p>- Will continue development of a prototype Modeling and Simulation tool to address the need for improved threat IADS passive detection/tracking and combat identification</p> <p>- Will continue development a prototype for providing improved EW information to operational users by leveraging the capabilities of the modernized, national EW databases; this will include signal identification, waveform ambiguity detection and emitter descriptions across all three national EW databases</p> <p>- Will continue user evaluations and prototype releases</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Slight increase brings effort in line with FY18 level of effort.</p> | | | | |
| Accomplishments/Planned Programs Subtotals | | 1.164 | 1.147 | 1.169 |
| C. Other Program Funding Summary (\$ in Millions) | | | | |
| N/A | | | | |
| Remarks | | | | |
| D. Acquisition Strategy | | | | |
| Requirements of new/upgraded intelligence analysis tools are identified and prioritized by the ACC. Development of capabilities to meet these requirements is managed by AFRL Rome Research Site. Prototype products (usually software), once evaluated by the users, are fielded in incremental capability spirals. All major contracts within this project are awarded after full and open competition. | | | | |
| E. Performance Metrics | | | | |
| Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission. | | | | |

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603260F / <i>Intelligence Advanced Development</i> | Project (Number/Name) 64537A / <i>INTELLIGENCE ANALYSIS CAPABILITIES (IAC)</i> |

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|--|---------|--|--|--|---------|--|--|--|---------|--|--|--|---------|--|--|--|---------|--|--|--|---------|--|--|--|---------|--|--|--|
| IAC | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IAC Development | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Query class system to search large volumes of multimodal / multilingual sources | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Modeling and Simulation for improved IADS passive detection/tracking and combat ID | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mobile C4 database and visualization for intelligence operators | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Improved EW information by leveraging capabilities of modernized national EW databases | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FY18 IAC User Evaluations & Prototype Releases | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FY19 IAC User Evaluations & Prototype Releases | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FY20 IAC User Evaluations & Prototype Releases | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FY21 IAC User Evaluations & Prototype Releases | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FY22 IAC User Evaluations & Prototype Releases | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FY23 IAC User Evaluations & Prototype Releases | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FY24 IAC User Evaluations & Prototype Releases | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603260F / <i>Intelligence Advanced Development</i> | Project (Number/Name) 64537A / <i>INTELLIGENCE ANALYSIS CAPABILITIES (IAC)</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| IAC | | | | |
| IAC Development | 1 | 2018 | 4 | 2024 |
| Query class system to search large volumes of multimodal / multilingual sources | 1 | 2018 | 4 | 2020 |
| Modeling and Simulation for improved IADS passive detection/tracking and combat ID | 1 | 2018 | 4 | 2020 |
| Mobile C4 database and visualization for intelligence operators | 1 | 2019 | 4 | 2020 |
| Improved EW information by leveraging capabilities of modernized national EW databases | 1 | 2019 | 4 | 2020 |
| FY18 IAC User Evaluations & Prototype Releases | 1 | 2018 | 4 | 2018 |
| FY19 IAC User Evaluations & Prototype Releases | 1 | 2019 | 4 | 2019 |
| FY20 IAC User Evaluations & Prototype Releases | 1 | 2020 | 4 | 2020 |
| FY21 IAC User Evaluations & Prototype Releases | 1 | 2021 | 4 | 2021 |
| FY22 IAC User Evaluations & Prototype Releases | 1 | 2022 | 4 | 2022 |
| FY23 IAC User Evaluations & Prototype Releases | 1 | 2023 | 4 | 2023 |
| FY24 IAC User Evaluations & Prototype Releases | 1 | 2024 | 4 | 2024 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0603742F / <i>Combat Identification Technology</i> |
|--|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 23.578 | 18.194 | 27.085 | 0.000 | 27.085 | 26.444 | 24.834 | 25.287 | 25.742 | Continuing | Continuing |
| 642597: <i>Noncooperative Identification Subsystems</i> | - | 21.623 | 18.194 | 24.545 | 0.000 | 24.545 | 22.164 | 20.049 | 20.464 | 20.981 | Continuing | Continuing |
| 642599: <i>Cooperative Identification Techniques</i> | - | 1.955 | 0.000 | 2.040 | 0.000 | 2.040 | 2.080 | 2.085 | 2.123 | 2.161 | Continuing | Continuing |
| 643420: <i>Combat ID Database Development</i> | - | 0.000 | 0.000 | 0.500 | 0.000 | 0.500 | 2.200 | 2.700 | 2.700 | 2.600 | Continuing | Continuing |

Note

This program, BA 4, PE 0603742F, project 642597, Multi-Mode Ladar Aided Target Recognition (M2LATR), is a new start.

A. Mission Description and Budget Item Justification

Combat Identification (CID) is the process of determining the identity of an entity in the battlespace. It is essential to determine if that entity is a friend, neutral or enemy; and if an enemy, the nature of the entity determines how it should be engaged. The CID team's mission is to identify new and promising CID technology candidates, evaluate the usefulness of the technologies, conduct demonstrations in operationally relevant environments, and coordinate strategies that expedite transition to more than one platform. This PE aims to integrate and transition new capabilities into fielded systems, and improve existing capabilities. The mission area consists of two thrusts: cooperative CID and non-cooperative CID. Cooperative CID systems require communication between two participating platforms. Non-cooperative CID techniques do not depend on a response from the targeted platform - such as high range resolution radar that measures the length of a target. Both cooperative and non-cooperative CID techniques are currently in the field, and are necessary elements of the kill chain that ensure mission success and reduce fratricide.

Non-cooperative CID employs a number of sensing technologies and signal processing techniques. The observations are compared to a database to identify battlespace entities. These technologies include: (1) Laser Vision, an Electro-Optical/Infrared (EO/IR) imaging system that significantly increases ID ranges; (2) Hydra Vision, a balanced (robust) amalgamation of sensor data from multiple sources to provide warfighters with higher confidence CID results on surface or air targets, fusion to counter camouflage, concealment and deception (CCD), and multi-phenomenology features for sustainable databases; (3) Compact Aided Target Recognition (AiTR) and Sustainable Environments (CASE), a CID approach that focuses on tailoring algorithms to use smaller, more efficient databases that are faster and less expensive to generate and maintain; (4) Passive Radio Frequency (RF) ID Environment (PRIDE), a program to develop passive RF target ID capability for denied access environment using passive RF and electronic warfare (EW) information; (5) Radio ID (RID), a program to develop methods for using advances in digital radio technologies such as software defined radios to provide low cost ID solutions to enhance CID, improve aircrew situational awareness and assist in fratricide prevention with military and civil air platforms, potentially fusing non-cooperative techniques and cooperative technologies; and (6) Enhanced Combat ID (ECID), a program under Studies to develop a robust ability to quantitatively evaluate promising CID technologies using enhanced modeling and simulation (M&S) capabilities.

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0603742F / <i>Combat Identification Technology</i> | |
| <p>Cooperative Combat Identification (CID) employs technologies required to rapidly identify friendly platforms. The program develops, integrates and evaluates technologies that provide AF platforms with a means of positively identifying an air or ground platform as a friendly, via active or passive cooperative identification capabilities. Development funded by this project ensures availability of a Mode 5 upgrade path for implementing ground and air platforms across the Air Force fleet.</p> <p>The Combat ID (CID) Database Initiative (DBI) effort is a new project under the Combat Identification (CID) portfolio and is designed to remove the "hard-coded" static ID parameters from the host platform's sensor and replace them with parameterized values that are dynamic. The DBI project primarily consists of four efforts: a.) determining the requisite ID parameters for CID, b) designing and developing a database to contain the CID parameters identified in Task a, c) developing techniques to generate the requisite parameters, and d) provide CID parameters developed from measured or modeled data. This project is projected to begin in early FY-20 therefore no funds have been required/requested previously.</p> <p>In FY20 our non-cooperative goals will be to complete the first transition of a feature-level fusion ATR capability for air targets onto F-16 AESA aircraft under Air to Air Hydravision, providing a substantial improvement in CID performance at long range. This effort will lead the way for other platforms to integrate this capability. AAHV will also transition a major improvement in air target CID to the F-15E AESA aircraft. CASE will be in the final demonstration phase of a significant ground target CID capability that will transition to F-15E AESA and F/A-18 AESA the following year. VAMP and 3DTO will both be preparing to transition CID capability to Litening in FY21. FY20 will see the initiation of three major programs, to include Integrated Determination of ID (ID2) - using advances associated with Joint Multisensor Advanced CID (JMAC) to provide feature-level fusion to ground target ID; Integrated Combat ID with EW (ICE), pulling EW-specific features into feature-level fusion; and Kill Chain Weapons Integrated CID (KWIC), using information from launched weapons through a back link to provide CID from within the hot battlespace.</p> <p>In FY20 our cooperative goals will be to test and certify the responsibilities for the present Mark XII system, develop and integrate the new Mark XIIA (Mode 5) IFF system, and develop/integrate civil Mode S capabilities into Mark XIIA IFF equipment.</p> <p>The FY20 DBI objectives are: a) determine the requisite CID features for HRR and NCTR and b) specify the requirements for initial database design, and finally c) collect initial sample data to populate the database for developmental test/debug. The benefit of using Mission Definable parameters is that they are dynamically developed and can be added, edited, or removed by preflight Mission Planning software such as the Joint Mission Planning System (JMPS).</p> <p>FY20 will initiate a New Start called Multi-Mode Ladar Aided Target Recognition (M2LATR) which combines the work of 3DTO (3D laser imaging) and SIREN/VAMP (laser vibrometry) to create a longer-range fused-feature CID technique that uses the combined orthogonal features of both systems to provide a robust long-range CID capability. The Combat ID DBI Development effort is a new start in FY20.</p> <p>Activities also include studies and analysis to support both current program planning and execution and future program planning.</p> <p>This program element may include necessary civilian pay expenses required to manage, execute, and deliver Combat Identification technologies. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, and 0605898F.</p> | | |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0603742F / <i>Combat Identification Technology</i> |
|--|---|

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 24.397 | 18.194 | 27.085 | 0.000 | 27.085 |
| Current President's Budget | 23.578 | 18.194 | 27.085 | 0.000 | 27.085 |
| Total Adjustments | -0.819 | 0.000 | 0.000 | 0.000 | 0.000 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | -0.819 | 0.000 | 0.000 | 0.000 | 0.000 |

Change Summary Explanation

The FY19 funding request was reduced by \$5.461M. Payback is planned for FY20 & FY21. This funding will enable the CID portfolio to continue developing critical CID technologies.

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 4 | | | | | R-1 Program Element (Number/Name) PE 0603742F / <i>Combat Identification Technology</i> | | | | Project (Number/Name) 642597 / <i>Noncooperative Identification Subsystems</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 642597: <i>Noncooperative Identification Subsystems</i> | - | 21.623 | 18.194 | 24.545 | 0.000 | 24.545 | 22.164 | 20.049 | 20.464 | 20.981 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

Note

This program, BA 4, PE 0603742F, project 642597, Multi-Mode Ladar Aided Target Recognition (M2LATR), is a new start.

A. Mission Description and Budget Item Justification

Non-cooperative CID employs a number of sensing technologies and signal processing techniques. The observations may be compared to a database of known objects to identify surface or air threats from air platforms. These technologies include: (1) Laser Vision, an Electro-Optical/Infrared (EO/IR) imaging system that significantly increases ID ranges; (2) Hydra Vision, a balanced (robust) amalgamation of sensor data from multiple sources to provide warfighters with higher confidence CID results on surface or air targets potentially including fusion with intelligence sources, identification of non-traditional targets, fusion to counter camouflage, concealment and deception (CCD), and multi-phenomenology features for sustainable databases; (3) Compact AiTR (Aided Target Recognition) and Sustainable Environments (CASE), a CID approach that focuses on tailoring algorithms to utilize smaller, more efficient databases that are faster and less expensive to generate and maintain; (4) Passive RF ID Environment (PRIDE), a program to develop passive RF target ID capability for denied access environment utilizing passive RF and EW information with potential non-traditional ISR capabilities; (5) Radio ID (RID) will develop methods for utilizing advances in digital radio technologies such as software defined radios, to provide low cost ID solutions to enhance Combat ID, improve aircrew situational awareness and assist in fratricide prevention with military and civil air platforms, potentially fusing non-cooperative techniques and cooperative technologies; and (6) Enhanced Combat ID (ECID), a program under Studies to develop a robust ability to quantitatively evaluate promising CID technologies using enhanced modeling and simulation (M&S) capabilities.

In FY20 our goal is to complete the first transition of a feature-level fusion ATR capability for air targets onto F-16 AESA aircraft under Air to Air Hydra vision, providing a substantial improvement in CID performance at long range. This effort will lead the way for other platforms to integrate this capability. AAHV will also transition a major improvement in air target CID to the F-15E AESA aircraft. CASE will be in the final demonstration phase of a significant ground target CID capability that will transition to F-15E AESA and F/A-18 AESA the following year. VAMP and 3DTO will both be preparing to transition CID capability to Litening in FY21. FY20 will see the initiation of three major programs, to include Integrated Determination of ID (ID2) - using advances associated with JMAC to provide feature-level fusion to ground target ID; Integrated Combat ID with EW (ICE), pulling EW-specific features into feature-level fusion; and Kill Chain Weapons Integrated CID (KWIC), using information from launched weapons through a back link to provide CID from within the hot battlespace.

Activities also include studies and analysis to support both current program planning and execution and future program planning.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver Combat Identification technologies. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, and 0605898F.

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603742F / <i>Combat Identification Technology</i> | Project (Number/Name) 642597 / <i>Noncooperative Identification Subsystems</i> |

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| <p>Title: Laser Vision/VAMP</p> <p>Description: The Vibrometry Advanced Mode Processor (VAMP) program develops advanced algorithms for processing data provided by laser vibrometry sensors to demonstrate prototype pilot Aided Target Recognition software. VAMP will leverage ability of active electro-optic sensors to sense micro-displacements of operating machinery to measure the resulting frequency spectrum. The program will assess utility for air-to-ground CID. FY19 - VAMP is conducting a data collection campaign to identify salient target features. FY20 - VAMP will apply AiTR algorithms to determine how well the technology can separate target classes.</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none"> - Conduct MASINT flights to collect in-range vibrometry sensor data and associated meta data - Continue assessments of advanced algorithms for feature extraction and classifier functions - Update Interface Control Documents to latest vibrometer sensor revision level - Initiate vehicle database collection and associated software development - Perform ground/flight Testing <p>FY 2020 Base Plans: Will work to complete testing and evaluations.</p> <p>FY 2020 OCO Plans: N/A</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding decreased due to program being in final stages; therefore less funds will be needed to complete testing and documenting results.</p> | 2.032 | 1.800 | 1.250 | 0.000 | 1.250 |
| <p>Title: Laser Vision/3-D Ladar</p> <p>Description: Laser Vision is part of a family of electro-optical (EO) systems that significantly increase ID ranges. Provide the demonstration and evaluation data necessary to support decisions on future EO technologies supporting CID, including 3-D (3-dimensional) imaging laser radar (Ladar) and exploration of advanced concepts. The 3-D ladar technology provides a display of a 3-D EO image to the pilot for high confidence combat identification and is a potential for the next generation targeting pods for the USAF.</p> <p>FY 2019 Plans:</p> | 2.310 | 0.600 | 0.600 | 0.000 | 0.600 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603742F / <i>Combat Identification Technology</i> | Project (Number/Name) 642597 / <i>Noncooperative Identification Subsystems</i> | | | |
| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
| <p>Conduct Algorithm development for 3D.</p> <p>FY 2020 Base Plans: Will continue Algorithm development for 3D.</p> <p>FY 2020 OCO Plans: N/A</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding decreased due to program reaching completion.</p> | | | | | |
| <p>Title: Hydra Vision/Air to Air</p> <p>Description: Hydra Vision (Multi-Sensor Enhanced ID) is a balanced (robust) amalgamation of sensor data from multiple sources to provide warfighters with higher confidence CID results on surface or air targets. There are two main thrusts occurring simultaneously, Air-to-Air and Air-to-Ground.</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none"> - Down select from FY18 phenomenology - Study and refine the most promising solutions - Adapt target recognition algorithms - Generate models and update database to incorporate information from chosen phenomenologies - Prepare for demonstration flights of developed technology <p>FY 2020 Base Plans:</p> <ul style="list-style-type: none"> - Will continue to generate models and update database information - Will examine all flight demonstrations of technology development <p>FY 2020 OCO Plans: N/A</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding increased due to efforts now moving to flight test and associated test costs.</p> | 4.076 | 3.400 | 5.144 | 0.000 | 5.144 |
| <p>Title: Hydra Vision/Air to Ground</p> <p>Description: Hydra Vision (Multi-Sensor Enhanced ID) is a family of balanced (robust) amalgamation of sensor data from multiple sources to provide warfighters with higher confidence CID results on surface or air targets.</p> | 0.384 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603742F / <i>Combat Identification Technology</i> | Project (Number/Name) 642597 / <i>Noncooperative Identification Subsystems</i> |

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| <p>FY 2019 Plans: Completed in FY18.</p> <p>FY 2020 Base Plans: N/A</p> <p>FY 2020 OCO Plans: N/A</p> | | | | | |
| <p>Title: Compact AiTR (Aided Target Recognition) and Sustainable Environment (CASE)</p> <p>Description: CASE is a family of efforts to address efficiency and sustainability issues associated with the development, operation and maintenance of non-cooperative AiTR technology. Develop sustainable multi-phenomenology AiTR based on low fidelity, compact, and inexpensive database technology.</p> <p>FY 2019 Plans: - Continue flight demo analysis</p> <p>FY 2020 Base Plans: - Will examine all flight demonstrations</p> <p>FY 2020 OCO Plans: N/A</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding increased due to final test flights being conducted in FY20</p> | 2.664 | 2.200 | 2.695 | 0.000 | 2.695 |
| <p>Title: Passive RF ID Environment (PRIDE)</p> <p>Description: Develop passive RF target ID capability for denied access environment utilizing passive RF and EW information with potential non-traditional ISR capabilities.</p> <p>FY 2019 Plans: - Conduct Proof-of-concept on target platform to facilitate timely transition</p> <p>FY 2020 Base Plans: - Will continue developing techniques that will assist in the transitioning of ISR capabilities</p> <p>FY 2020 OCO Plans:</p> | 6.305 | 3.050 | 5.547 | 0.000 | 5.547 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | Date: February 2019 | |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603742F / <i>Combat Identification Technology</i> | | Project (Number/Name) 642597 / <i>Noncooperative Identification Subsystems</i> | | |
| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
| N/A | | | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: Funding increased due to previous collection activity in FY19 being curtailed from overall PE budget cuts and effort will now resume additional bistatic data collection to enable validation of synthetic modeling techniques which will require additional funds in FY20. | | | | | |
| Title: Radio ID (RID) Description: RID will develop technologies to integrate radio based cooperative technologies with non-cooperative technologies into the cockpit. The benefits will be increased confidence target ID and situational awareness as well as reduced fratricides. FY 2019 Plans: - Conduct Risk Reduction, Initial Development, PDR, and Lab Demo FY 2020 Base Plans: - Will perform lab demonstrations - Will continue to develop integrative radio based cooperative technologies FY 2020 OCO Plans: N/A FY 2019 to FY 2020 Increase/Decrease Statement: Funding increased due to FY19 funds being lower because of reduced prior year funds and effort will now resume a more normal funding profile. | 1.049 | 1.725 | 3.226 | 0.000 | 3.226 |
| Title: Studies Description: Conduct CID-related studies/demos. FY 2019 Plans: - Develop architecture - Develop algorithm - Design system FY 2020 Base Plans: | 2.803 | 5.419 | 3.683 | 0.000 | 3.683 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603742F / <i>Combat Identification Technology</i> | Project (Number/Name) 642597 / <i>Noncooperative Identification Subsystems</i> |

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| - Will continue to perform system designs and continue to develop algorithms. FY 2020 OCO Plans: N/A FY 2019 to FY 2020 Increase/Decrease Statement: Funding decreased due to programs having moved from a study phase during FY19 and will now transition to program activities (funding) on separate lines in FY20. | | | | | |
| Title: Multi-Mode Ladar Aided Target Recognition (M2LATR) Description: A New Start Program called Multi-Mode Ladar Aided Target Recognition (M2LATR), which combines the work of 3DTO (3D laser imaging) and SIREN/VAMP (laser vibrometry), to create a longer-range fused-feature CID technique that uses the combined orthogonal features of both systems to provide a robust long-range CID capability. FY 2019 Plans: N/A FY 2020 Base Plans: Will begin combining the orthogonal features of both the 3DTO and SIREN/VAMP to provide a robust long-range CID capability. FY 2020 OCO Plans: N/A FY 2019 to FY 2020 Increase/Decrease Statement: This is an FY20 new start program. | 0.000 | 0.000 | 2.400 | 0.000 | 2.400 |
| Accomplishments/Planned Programs Subtotals | 21.623 | 18.194 | 24.545 | 0.000 | 24.545 |

C. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

D. Acquisition Strategy

Combat Identification develops technologies for exploitation by the USAF and other services.
Award multiple, competitive contract vehicles emphasizing off-the-shelf technology and maximizing the use of non-developmental items (NDIs).

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603742F / <i>Combat Identification Technology</i> | Project (Number/Name) 642597 / <i>Noncooperative Identification Subsystems</i> |

Management develops a technology to a point it can be demonstrated in a relative combat environment.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603742F / <i>Combat Identification Technology</i> | Project (Number/Name) 642597 / <i>Noncooperative Identification Subsystems</i> |
|--|---|--|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Hydra Vision (Air-to-Air) - L | C/CPFF | Leidos : Reston, VA | - | 0.900 | Oct 2017 | 0.900 | Oct 2018 | 1.000 | Feb 2020 | - | | 1.000 | Continuing | Continuing | - |
| Hydra Vision (Air-to-Air) - N | C/CPFF | Northrop Grumman : Linthicum Heights, MD | - | 0.965 | Oct 2017 | 0.000 | Oct 2018 | 0.000 | Oct 2019 | - | | 0.000 | Continuing | Continuing | - |
| Hydra Vision (Air-to-Air) - R | C/CPFF | Raytheon Company : El Segundo, CA | - | 1.084 | Oct 2017 | 0.000 | Jan 2019 | 0.000 | Oct 2019 | - | | 0.000 | Continuing | Continuing | - |
| 3-D Ladar | C/CPFF | Northrop Grumman : Rolling Meadows, IL | - | 1.709 | Dec 2017 | 0.000 | | 0.000 | | - | | 0.000 | Continuing | Continuing | - |
| Hydra Vision, Target Recognition & Tracking Technology/CASE-S | MIPR | Sandia : Albuquerque, NM | - | 1.390 | Mar 2018 | 0.660 | Mar 2019 | 1.000 | Oct 2019 | - | | 1.000 | Continuing | Continuing | - |
| Studies - ECID OMS SME | C/CPAF | Ball Aerospace : MD | - | 0.100 | Aug 2018 | 0.100 | Dec 2018 | 0.100 | Dec 2019 | - | | 0.100 | Continuing | Continuing | - |
| Software on Chip for Classification, Exploitation and Reconnaissance (SOCCER) | C/CPAF | AER : TBD | - | 0.039 | Jan 2018 | 0.000 | Jan 2019 | 0.000 | | - | | 0.000 | Continuing | Continuing | - |
| Studies - ECID | PO | AFIT : Dayton, OH | - | 0.050 | Jun 2018 | 0.055 | Dec 2018 | 0.065 | Dec 2019 | - | | 0.065 | Continuing | Continuing | - |
| Hydra Vision - Air to Ground - R | C/CPFF | Raytheon : ElSegundo, CA | - | - | | 0.000 | Jan 2019 | - | | - | | - | Continuing | Continuing | - |
| Hydra Vision - Air to Ground - L | C/CPAF | Leidos : McLean, VA | - | - | | 0.000 | Jan 2019 | - | | - | | - | Continuing | Continuing | - |
| Hydra Vision Ops Demo - B | C/CPAF | BAE : Dayton, OH | - | 0.260 | May 2018 | 0.000 | | - | | - | | - | Continuing | Continuing | - |
| CASE - Compact AiTR and Sustainable Environment Analysis - L | C/CPFF | Leidos : Mclean, VA | - | 1.395 | Nov 2017 | 1.200 | Nov 2018 | 1.095 | Oct 2019 | - | | 1.095 | Continuing | Continuing | - |
| Passive Radar Identification Environment (PRIDE) - L | C/CPFF | Leidos : Mclean, VA | - | 3.275 | Jan 2018 | 0.900 | Jan 2019 | 1.000 | Oct 2019 | - | | 1.000 | Continuing | Continuing | - |
| Passive Radar Identification Environment (PRIDE) -STR | C/CPFF | Systems and Technology Research : Woburn, MA | - | 1.000 | Jan 2018 | 0.900 | Jan 2019 | 1.000 | Oct 2019 | - | | 1.000 | Continuing | Continuing | - |

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|--|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603742F / <i>Combat Identification Technology</i> | Project (Number/Name) 642597 / <i>Noncooperative Identification Subsystems</i> |
|--|---|--|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|---|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Passive Radar Identification Environment (PRIDE) - IAI | C/CPFF | Integrated Applications Inc : Chantilly, VA | - | 1.000 | Jan 2018 | 0.900 | Jan 2019 | 1.000 | Oct 2019 | - | | 1.000 | Continuing | Continuing | - |
| Radio Identification (RID) | MIPR | DMEA : Sacramento, CA | - | 1.049 | Apr 2018 | 1.725 | Feb 2019 | 3.226 | Feb 2020 | - | | 3.226 | Continuing | Continuing | - |
| Alternate Band CID (ABC) | C/CPAF | Matrix : Dayton, OH | - | 0.435 | Jul 2017 | 0.000 | Dec 2018 | 0.444 | Dec 2019 | - | | 0.444 | Continuing | Continuing | - |
| M2LATR | C/CPFF | TBD : TBD | - | - | | 0.969 | Aug 2019 | 2.400 | Jan 2020 | - | | 2.400 | Continuing | Continuing | - |
| VAMP | C/CPAF | Northrop Grumman : Rolling Meadows, IL | - | 1.138 | Mar 2019 | 1.800 | Feb 2019 | 1.250 | Feb 2020 | - | | 1.250 | Continuing | Continuing | - |
| CLOVIS | C/CPAF | Not specified. : TBD | - | 0.796 | Mar 2018 | - | | - | | - | | - | Continuing | Continuing | - |
| Infoscitex | C/CPAF | Infoscitex : Dayton, OH | - | 0.330 | Jul 2018 | 0.450 | Mar 2019 | 0.480 | Mar 2020 | - | | 0.480 | Continuing | Continuing | - |
| PRECISE-N | C/CPAF | Northrop Grumman : Baltimore, MD | - | 0.400 | Sep 2018 | 1.000 | Oct 2018 | 1.800 | Oct 2019 | - | | 1.800 | Continuing | Continuing | - |
| PRECISE-R | C/CPAF | Raytheon : El Segundo, CA | - | 0.100 | Sep 2018 | 1.000 | Nov 2018 | 2.000 | Oct 2019 | - | | 2.000 | Continuing | Continuing | - |
| PRECISE-M | C/CPAF | Matrix : Dayton, OH | - | 0.100 | Sep 2018 | 0.500 | Nov 2018 | 0.544 | Nov 2019 | - | | 0.544 | Continuing | Continuing | - |
| ATISS | C/CPAF | Not specified. : TBD | - | 0.030 | Aug 2018 | 0.000 | | 0.000 | | - | | 0.000 | Continuing | Continuing | - |
| Wright State University | C/CPAF | Wright State Research : Dayton, OH | - | 0.015 | Aug 2018 | 0.000 | | 0.000 | | - | | 0.000 | Continuing | Continuing | - |
| CAST | MIPR | DMEA : Sacramento, CA | - | 1.069 | Sep 2018 | 1.000 | Dec 2018 | 1.000 | Dec 2019 | - | | 1.000 | Continuing | Continuing | - |
| Concept Call #1 | C/CPAF | TBD : TBD | - | - | | - | | 0.100 | Nov 2019 | - | | 0.100 | Continuing | Continuing | - |
| Integrated Determination of IDs (ID2) | C/CPAF | TBD : TBD | - | - | | - | | 0.283 | Nov 2019 | - | | 0.283 | Continuing | Continuing | - |
| Integrated CID EW | C/CPAF | TBD : TBD | - | - | | - | | 0.500 | Dec 2019 | - | | 0.500 | Continuing | Continuing | - |
| Kill Chain Weapons Integrated CID | C/CPAF | TBD : TBD | - | - | | - | | 0.679 | Jan 2020 | - | | 0.679 | Continuing | Continuing | - |
| Subtotal | | | - | 18.629 | | 14.059 | | 20.966 | | - | | 20.966 | Continuing | Continuing | N/A |

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603742F / <i>Combat Identification Technology</i> | Project (Number/Name) 642597 / <i>Noncooperative Identification Subsystems</i> |
|--|---|--|

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---------------------------------|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Systems Engineering Support | MIPR | MITRE : Rome, NY | - | 0.354 | Mar 2018 | 0.350 | Mar 2019 | 0.200 | Dec 2019 | - | | 0.200 | Continuing | Continuing | - |
| X-Patch Bistatic Validation | C/CPAF | Leidos : Dayton, OH | - | 0.300 | Sep 2018 | 0.000 | | 0.524 | | - | | 0.524 | Continuing | Continuing | - |
| VAMP Support | C/CPAF | Not specified. : TBD | - | 0.055 | | 0.000 | | 0.000 | | - | | 0.000 | Continuing | Continuing | - |
| ECID MS&A | C/CPAF | TBD : TBD | - | - | | 0.500 | Dec 2018 | 0.800 | Dec 2019 | - | | 0.800 | Continuing | Continuing | - |
| Subtotal | | | - | 0.709 | | 0.850 | | 1.524 | | - | | 1.524 | Continuing | Continuing | N/A |

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|------------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| PRIDE Data Collection | MIPR | 46th Test Wing : Eglin AFB, FL | - | 0.000 | Feb 2018 | 0.200 | Feb 2019 | 1.200 | Dec 2019 | - | | 1.200 | Continuing | Continuing | - |
| Air-to-Air Hydra Vision Flight Test | MIPR | 412 Test Wing : Edwards, CA | - | 0.127 | Oct 2017 | 0.000 | | 0.000 | | - | | 0.000 | Continuing | Continuing | - |
| AP Hill | C/CPAF | AP Hill : Ft AP Hill, VA | - | 0.044 | Aug 2018 | 0.000 | | 0.000 | | - | | 0.000 | Continuing | Continuing | - |
| Bistatic Data Collection | C/CPAF | University of Oklahoma : Tulsa, OK | - | 0.070 | Sep 2018 | 0.000 | Aug 2019 | 0.000 | | - | | 0.000 | Continuing | Continuing | - |
| Subtotal | | | - | 0.241 | | 0.200 | | 1.200 | | - | | 1.200 | Continuing | Continuing | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| AFRL PMA | MIPR | GSA : Denver, CO | - | 1.044 | Mar 2018 | 1.523 | Mar 2019 | 0.600 | Mar 2020 | - | | 0.600 | Continuing | Continuing | - |
| Systems Engineering Program Management (AIMSPO)-Mode 5 Level 2 B Cooperative | MIPR | DMEA : McClellan, CA | - | 1.000 | Jan 2018 | 0.375 | Feb 2019 | - | | - | | - | Continuing | Continuing | - |

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|--|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603742F / <i>Combat Identification Technology</i> | Project (Number/Name) 642597 / <i>Noncooperative Identification Subsystems</i> |
|--|---|--|

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | | | Target Value of Contract |
|---|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | |
| System Engineering Program Management (AIMSPO) Cooperative | MIPR | DTIC : Robins AFB, GA | - | 0.000 | Feb 2018 | 0.986 | Feb 2019 | 0.255 | | - | | 0.255 | Continuing | Continuing | - |
| Program Office Support Cooperative | Various | Various : Various | - | - | | 0.100 | Oct 2018 | - | | - | | - | Continuing | Continuing | - |
| Program Office Support DOD AIMS Process System (DAPS) data base Cooperative | MIPR | 78ABW : Robins AFB, FM | - | - | | 0.101 | Jun 2019 | - | | - | | - | Continuing | Continuing | - |
| Subtotal | | | - | 2.044 | | 3.085 | | 0.855 | | - | | 0.855 | Continuing | Continuing | N/A |
| | | | Prior Years | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
| Project Cost Totals | | | - | 21.623 | | 18.194 | | 24.545 | | - | | 24.545 | Continuing | Continuing | N/A |

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force

Date: February 2019

Appropriation/Budget Activity
3600 / 4

R-1 Program Element (Number/Name)
PE 0603742F / *Combat Identification
Technology*

Project (Number/Name)
642597 / *Noncooperative Identification
Subsystems*

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| <i>Combat Identification Technology</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| LASER VISION - VAMP | [Redacted] | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| LASER VISION - VAMP Lab Demo | [Redacted] | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| LASER VISION - VAMP POD Demo | [Redacted] | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| LASER VISION - 3D Ladar (3DTO) | [Redacted] | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| LASER VISION - 3D Ladar (3DTO) Lab Demo | [Redacted] | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| LASER VISION - 3D Ladar (3DTO) POD Demo | [Redacted] | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hydra Vision - Air to Air (2 & 3 Features) (TRL-6 begins 3Qt FY18) | [Redacted] | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hydra Vision - Air to Air 2 Feature RT Demo | [Redacted] | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hydra Vision - Air to Air 3 Feature RT Demo | [Redacted] | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Compact AiTR - Compact Feature AiTR | [Redacted] | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Compact AiTR - Compact Feature LiDAR AiTR Lab Demo (May 2017) | [Redacted] | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Compact AiTR- Compact Feature AiTR - Flight Demo (Jul 2017) | [Redacted] | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Passive RF ID (PRIDE) | [Redacted] | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Passive RF ID (PRIDE) - Lab Demo (Jun 20) | [Redacted] | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Passive RF ID (PRIDE) - OPS Demo (Dec 2022) | [Redacted] | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Radio ID (RID) | [Redacted] | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Radio ID - Lab Demo #1 (Jul 2019) | [Redacted] | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Radio ID - Lab Demo #2 (Jan 2021) | [Redacted] | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Radio ID - Flight Demo (Aug 2022) | [Redacted] | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|--|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603742F / <i>Combat Identification Technology</i> | Project (Number/Name) 642597 / <i>Noncooperative Identification Subsystems</i> |
|--|---|--|

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|--|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Studies | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Enhanced CID (ECID) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603742F / <i>Combat Identification Technology</i> | Project (Number/Name) 642597 / <i>Noncooperative Identification Subsystems</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Combat Identification Technology</i> | | | | |
| LASER VISION - VAMP | 1 | 2018 | 1 | 2022 |
| LASER VISION - VAMP Lab Demo | 4 | 2019 | 4 | 2019 |
| LASER VISION - VAMP POD Demo | 3 | 2021 | 3 | 2021 |
| LASER VISION - 3D Ladar (3DTO) | 1 | 2018 | 1 | 2019 |
| LASER VISION - 3D Ladar (3DTO) Lab Demo | 2 | 2018 | 2 | 2018 |
| LASER VISION - 3D Ladar (3DTO) POD Demo | 4 | 2018 | 4 | 2018 |
| Hydra Vision - Air to Air (2 & 3 Features) (TRL-6 begins 3Qt FY18) | 1 | 2018 | 2 | 2024 |
| Hydra Vision - Air to Air 2 Feature RT Demo | 4 | 2018 | 4 | 2021 |
| Hydra Vision - Air to Air 3 Feature RT Demo | 4 | 2020 | 4 | 2020 |
| Compact AiTR - Compact Feature AiTR | 1 | 2018 | 4 | 2020 |
| Compact AiTR - Compact Feature LiDAR AiTR Lab Demo (May 2017) | 3 | 2018 | 3 | 2018 |
| Compact AiTR- Compact Feature AiTR - Flight Demo (Jul 2017) | 4 | 2018 | 4 | 2018 |
| Passive RF ID (PRIDE) | 4 | 2018 | 2 | 2024 |
| Passive RF ID (PRIDE) - Lab Demo (Jun 20) | 3 | 2020 | 3 | 2021 |
| Passive RF ID (PRIDE) - OPS Demo (Dec 2022) | 1 | 2023 | 1 | 2023 |
| Radio ID (RID) | 2 | 2018 | 4 | 2024 |
| Radio ID - Lab Demo #1 (Jul 2019) | 4 | 2019 | 4 | 2019 |
| Radio ID - Lab Demo #2 (Jan 2021) | 2 | 2021 | 2 | 2021 |
| Radio ID - Flight Demo (Aug 2022) | 3 | 2022 | 3 | 2022 |
| Studies | 1 | 2018 | 4 | 2024 |
| Enhanced CID (ECID) | 1 | 2018 | 1 | 2024 |

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|---|--------------------|----------------|----------------|---------------------|---|----------------------|----------------|----------------|---|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 4 | | | | | R-1 Program Element (Number/Name) PE 0603742F / <i>Combat Identification Technology</i> | | | | Project (Number/Name) 642599 / <i>Cooperative Identification Techniques</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 642599: <i>Cooperative Identification Techniques</i> | - | 1.955 | 0.000 | 2.040 | 0.000 | 2.040 | 2.080 | 2.085 | 2.123 | 2.161 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

Cooperative Combat Identification (CID) employs technologies required to rapidly identify friendly platforms. The program develops, integrates and evaluates technologies that provide AF platforms with a means of positively identifying an air or ground platform as a friendly, via active or passive cooperative identification capabilities. The development funded by this project ensures availability of a Mode 5 upgrade path for implementing ground and air platforms across the Air Force fleet. The DoD International AIMS PO has system level interoperability testing and certification responsibilities for the present Mark XII system, development and integration of the new Mark XIIA (Mode 5) IFF system, and development/integration of civil Mode S capabilities into Mark XIIA IFF equipment. The AIMS PO ensures IFF equipment/platform functionality IAW established standards and ensures total system interoperability to meet DoD/Service mission areas (e.g. Offensive Counter Air, Defensive Counter Air, and Integrated Air and Missile Defense). DoD International AIMS PO will continue to test and certify IFF equipment for the Services for as long as IFF is used for CID.

In FY20 our cooperative goals will be to test and certify the responsibilities for the present Mark XII system, develop and integrate the new Mark XIIA (Mode 5) IFF system, and also the development/integration of civil Mode S capabilities into Mark XIIA IFF equipment. The cooperative funds will be used to fund project and test engineers who will develop and test standards, perform certification testing in the field, process certifications and track all OSD/FAA guidelines to insure the program remains current. The OSD/FAA guidelines require Mode 5 be fully implemented by 2020 and the AIMS Program will insure those certifications are current on all applicable platforms/systems and work with both domestic and foreign military sales partners to insure compliance. The funds also support DOD representation to several military (US and NATO) and civil (FAA, ICAO and RTCA) requirements meetings for Mode 5, Mode S and ADS-B.

The FY19 funding request was reduced by \$5.461M. Payback is planned for FY20 & FY21. This funding will enable the CID portfolio to continue developing critical CID technologies.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| Title: Air Traffic Control and Radar Beacon Systems Identification Friend or Foe Mark XIIA System (AIMS) Program Office | 1.955 | 0.000 | 2.040 | 0.000 | 2.040 |
| Description: Develop and maintain technical standards on development, integration, testing, and certification of DoD IFF (Identification Friend or Foe) equipment. Coordinate and execute equipment/subsystem-level certifications and platform certifications of IFF capabilities (33 equipment and 84 platform certifications performed in FY17). | | | | | |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603742F / <i>Combat Identification Technology</i> | Project (Number/Name) 642599 / <i>Cooperative Identification Techniques</i> |

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|--|---------|---------|--------------|-------------|---------------|
| Support Foreign Military Sales of U.S. IFF equipment. Support NATO IFF Capabilities Team (Mode 5 IFF is a NATO waveform). Support International Civil Aviation Organization (ICAO) Technical Support Group (develops standards for world-wide civil Air Traffic Control). Create and maintain civil Mode S address assignments and military Mode 5 Platform ID Number (PIN) assignments for every DoD platform using these waveforms in their interrogator and/or transponder equipment. | | | | | |
| FY 2019 Plans: - Continue to fund AIMS for interoperability IFF testing (civil and military), FAA liaison, to support of Mode 4 / Mode 5 equipment, updating and developing IFF standards. | | | | | |
| FY 2020 Base Plans: - Will continue to fund AIMS for interoperability IFF testing (civil and military), FAA liaison, to support of Mode 4 / Mode 5 equipment, updating and developing IFF standards. | | | | | |
| FY 2020 OCO Plans: N/A | | | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: Funding increased due to realignment of funding between non cooperative and cooperative CID programs. | | | | | |
| Accomplishments/Planned Programs Subtotals | 1.955 | 0.000 | 2.040 | 0.000 | 2.040 |

C. Other Program Funding Summary (\$ in Millions)

| Line Item | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| • RDTE 04 0603742F: <i>Combat Identification Technology</i> | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | - | 0.000 | 0.000 |

Remarks

D. Acquisition Strategy

Combat Identification develops technologies for exploitation by the USAF and the other services. Award multiple, competitive contract vehicles emphasizing off-the-shelf technology and maximizing the use of non-developmental items (NDIs). Management develops a technology to a point it can be demonstrated in a relative combat environment.

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603742F / <i>Combat Identification Technology</i> | Project (Number/Name) 642599 / <i>Cooperative Identification Techniques</i> |

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603742F / <i>Combat Identification Technology</i> | Project (Number/Name) 642599 / <i>Cooperative Identification Techniques</i> |
|--|---|---|

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Systems Engineering / Program Management (AIMSPO) | MIPR | DTIC : Robins AFB, GA | - | 1.308 | Feb 2018 | 0.000 | Feb 2019 | 1.750 | Feb 2020 | - | | 1.750 | Continuing | Continuing | - |
| Systems Engineering/ Program Management (AIMSPO) - Mode 5 Level 2 B | MIPR | DMEA : McClellan, CA | - | 0.182 | Jan 2018 | 0.000 | Feb 2019 | 0.000 | | - | | 0.000 | Continuing | Continuing | - |
| Subtotal | | | - | 1.490 | | 0.000 | | 1.750 | | - | | 1.750 | Continuing | Continuing | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Program Office Support | Various | Various : Various | - | 0.172 | Sep 2018 | 0.000 | Sep 2019 | 0.125 | Sep 2020 | - | | 0.125 | Continuing | Continuing | - |
| Program Office Support - DOD AIMS Process System (DAPS) data base | MIPR | 78ABW : Robins AFB, GA | - | 0.293 | Dec 2017 | 0.000 | Jul 2019 | 0.165 | Jul 2020 | - | | 0.165 | Continuing | Continuing | - |
| Subtotal | | | - | 0.465 | | 0.000 | | 0.290 | | - | | 0.290 | Continuing | Continuing | N/A |

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract | |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|-----|
| Project Cost Totals | | - | 1.955 | 0.000 | 2.040 | - | 2.040 | Continuing | Continuing | N/A |

Remarks
 The FY19 funding request was reduced by \$5.461M. Payback is planned for FY20 & FY21. This funding will enable the CID portfolio to continue developing critical CID technologies.

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603742F / <i>Combat Identification Technology</i> | Project (Number/Name) 642599 / <i>Cooperative Identification Techniques</i> |

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
|---|---|
| <i>Cooperative Identification Techniques</i> | |
| AIMS Program Office Activities | |
| AIMS Program Office Annual Workshop (May 2018) | ■ |
| AIMS Program Office Annual Workshop (Apr 2019) | ■ |
| AIMS Program Office Annual Workshop (Apr 2020) | ■ |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603742F / <i>Combat Identification Technology</i> | Project (Number/Name) 642599 / <i>Cooperative Identification Techniques</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|---|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Cooperative Identification Techniques</i> | | | | |
| AIMS Program Office Activities | 1 | 2018 | 4 | 2024 |
| AIMS Program Office Annual Workshop (May 2018) | 3 | 2018 | 3 | 2018 |
| AIMS Program Office Annual Workshop (Apr 2019) | 3 | 2019 | 3 | 2019 |
| AIMS Program Office Annual Workshop (Apr 2020) | 3 | 2020 | 3 | 2020 |

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|---|--------------------|----------------|----------------|---------------------|---|----------------------|----------------|----------------|--|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 4 | | | | | R-1 Program Element (Number/Name) PE 0603742F / <i>Combat Identification Technology</i> | | | | Project (Number/Name) 643420 / <i>Combat ID Database Development</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 643420: <i>Combat ID Database Development</i> | - | 0.000 | 0.000 | 0.500 | 0.000 | 0.500 | 2.200 | 2.700 | 2.700 | 2.600 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

The Database Initiative (DBI) is a project, under the Combat Identification (CID) portfolio, designed to remove the "hard-coded" static ID parameters from the host platform's sensor and replace them with parameterized values that are dynamic. The DBI project primarily consists of four efforts: a.) determining the requisite ID parameters for CID, b) designing and developing a database to contain the CID parameters identified in Task a, c) developing techniques to generate the requisite parameters, and d) provide CID parameters developed from measured or modeled data.

This project is projected to begin in early FY-20 therefore no funds have been required/requested previously. The FY-20 objectives are: a.) determine the requisite CID features for HRR and NCTR and b) specify the requirements for initial database design, and finally c) collect initial sample data to populate the database for developmental test/debug. The benefit of using Mission Definable parameters is that they are dynamically developed and can be added, edited, or removed by preflight Mission Planning software such as the Joint Mission Planning System (JMPS). Current CID parameters for existing techniques, i.e. NCTR, are being developed faster than host platform OFPs. This leads to implementation lags as great as four years. By removing the "hard-coded" parameters from the sensors and enabling loading dynamic values via mission planning, the lag time could be reduced to days.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| Title: Database Development | - | 0.000 | 0.500 | - | 0.500 |
| Description: The Database Initiative (DBI) is a project, under the Combat Identification (CID) portfolio, designed to remove the "hard-coded" static ID parameters from the host platform's sensor and replace them with parameterized values that are dynamic. | | | | | |
| FY 2019 Plans: N/A | | | | | |
| FY 2020 Base Plans: This project is projected to begin in early FY-20 therefore no funds have been required/requested previously. The FY-20 objectives are: a.) determine the requisite CID features for HRR and NCTR and b) specify the requirements for initial database design, and finally c) collect initial sample data to populate the database for developmental test/debug. | | | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: | | | | | |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603742F / <i>Combat Identification Technology</i> | Project (Number/Name) 643420 / <i>Combat ID Database Development</i> |

| | | | | | |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
| This is a new start in FY20. | | | | | |
| Accomplishments/Planned Programs Subtotals | - | 0.000 | 0.500 | - | 0.500 |

| | | | | | | | | | | | |
|---|----------------|----------------|---------------------|--------------------|----------------------|----------------|----------------|----------------|----------------|-------------------------|-------------------|
| C. Other Program Funding Summary (\$ in Millions) | | | | | | | | | | | |
| Line Item | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| • RDTE 04 0603742F: <i>Combat Identification Technology</i> | - | - | 0.500 | - | 0.500 | - | - | - | - | Continuing | Continuing |

Remarks

D. Acquisition Strategy
 Combat Identification develops technologies for exploitation by the USAF and the other services. Award multiple, competitive contract vehicles emphasizing off-the-shelf technology and maximizing the use of non-developmental items (NDIs). Management develops a technology to a point it can be demonstrated in a relative combat environment.

E. Performance Metrics
 Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603742F / <i>Combat Identification Technology</i> | Project (Number/Name) 643420 / <i>Combat ID Database Development</i> |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------------------------------------|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| Combat ID Database Development | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Combat ID Database Development | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603742F / <i>Combat Identification Technology</i> | Project (Number/Name) 643420 / <i>Combat ID Database Development</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Combat ID Database Development</i> | | | | |
| Combat ID Database Development | 1 | 2020 | 4 | 2024 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0603790F / NATO Research and Development |
|--|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|----------------------------------|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 3.710 | 2.305 | 4.955 | 0.000 | 4.955 | 4.701 | 4.147 | 4.222 | 4.298 | 0.000 | 28.338 |
| 64NATO: <i>Nato Coop R&D</i> | - | 3.710 | 2.305 | 4.955 | 0.000 | 4.955 | 4.701 | 4.147 | 4.222 | 4.298 | 0.000 | 28.338 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | - | - |

Note
In FY 2016, PE 0603791F, International Space Cooperative Research & Development, Project 645035, International Space Coop R&D, efforts were transferred to PE 0603790F, NATO Research and Development, Project 64NATO, NATO Coop R&D, in order to consolidate international cooperative research and development activities.

A. Mission Description and Budget Item Justification

These funds will be used to initiate air, space, and cyber international cooperative research, and development (ICR&D) agreements with North Atlantic Treaty Organization (NATO) member states, major non-NATO allies and friendly foreign countries. Each of the selected activities and projects are required to have a concluded international agreement (IA), prior to funds being released, that implements the provisions of Title 10 U.S. Code, Section 2350a. This legislation (Title 10 U.S. Code, Section 2350) authorizes funds to significantly improve U.S. and allied conventional defense capabilities by leveraging the best defense technologies, eliminating costly duplication of R&D efforts, accelerating the availability of defense systems, and promoting US and allied interoperability or commonality. These funds will not be used for government civilian salaries, permanent construction, or spent overseas. This program element funds the implementation of Air Force ICR&D agreements in (1) Basic Research (2) Applied Research (3) Advanced Technology Development (4) Advanced Component Development and Prototypes (5) System Development and Demonstration and (6) RDT&E Management Support.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0603790F / NATO Research and Development |
|--|---|

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 3.851 | 2.305 | 4.955 | 0.000 | 4.955 |
| Current President's Budget | 3.710 | 2.305 | 4.955 | 0.000 | 4.955 |
| Total Adjustments | -0.141 | 0.000 | 0.000 | 0.000 | 0.000 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | -0.141 | 0.000 | 0.000 | 0.000 | 0.000 |

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| Title: International Cooperative Research and Development | 3.710 | 2.305 | 4.955 | 0.000 | 4.955 |
| Description: Supports bi- and multi-lateral international agreements that meet USAF RDT&E objectives and goals. Each of the cooperative projects that receive funding must meet one or more of the following requirements: enhance warfighter capabilities and coalition interoperability; accelerate the availability of defense systems; strengthen and reinforce strategic partnerships; gain access to the best defense technologies, capabilities and techniques; build relationships and influence with allies; and/or eliminate duplication of R&D efforts. | | | | | |
| FY 2019 Plans: FY19 cooperative projects involve RDT&E efforts in human performance, information systems, aerospace systems, munitions, materials and manufacturing, sensors, space situational awareness, missile warning, military satellite communications, global positioning systems, responsive space capabilities, cyber network defense and information assurance, and space vehicles. These projects include but are not limited to; two Classified Projects in Cyber; Physiological Assessment for Warfighter Performance Prediction; Sensors & PID Enhanced by Directed Energy; Real-time Decentralized Task Allocation for Heterogeneous Swarming UAV; Weapon Effects with respect to Military Operations in Urban Terrain; Coated CMCs for Hypersonics; Materials for Long Pulse Laser Protection; Counter Agile Radar Application; Collaborative Space Domain Awareness (SDA) Data Collection and Fusion; Airborne Data Exchange; Cooperative Research on Anti-swarm Fuze-sensor Technology; Adaptive Automation to Support Team Decision Making in Complex Environments; Solid Propellant Rotating Detonation Engine Demonstrator; Autonomous Fighter Risk Reduction Program; Infusion Processing | | | | | |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0603790F / NATO Research and Development |
|--|---|

| | | | | | |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|

and Fatigue; Analyses of Polymer Matrix Composites considering Environmental Effects; Cognitive Biomarker Sensor Development; Advanced Fuel-Spray Diagnostics for Propulsion Systems; Improved Durable Engines for UAVs; Bio-Inspired Technologies for Unmanned Autonomous Systems; Improved Elements for Next Gen RF-Directed Energy Weapons, Lasers and Detectors for UAS Systems; Measures for Evaluation of Air Vehicle Systems; RF Directed Energy Weapon Target Surrogates; Time Critical Targeting in Urban Environments; WarHead Improvements using Technology for Enhanced Functionality and Increased Survivability against Hard Targets; Protected Tactical Field Demonstration; and Protected Tactical Enterprise Service.

FY 2020 Base Plans:
FY20 cooperative projects involve RDT&E efforts in Autonomy, human performance, information systems, aerospace systems, munitions, materials and manufacturing, sensors, space situational awareness, missile warning, military satellite communications, global positioning systems, responsive space capabilities, cyber network defense and information assurance, and space vehicles. These projects include but are not limited to; Autonomous Fighter Risk Reduction; 5th Generation Ground Collision System Avoidance; Hypersonic ceramic composite; Protected Tactical Enterprise; Military Optical Communications and Optical Space Data Relay (MOSCOM)Support; NEMISIS-UAS surveillance; Deep Strike Weapon Systems THRESHER 1 and 2; Biological inspired technologies integrated on UAS platforms; Cyber Space-Building Trusted Networks and Resilient Systems, Space Situational Awareness; Impact Damage and Fire Effects; Spectral-aided tagging, tracking, and locating (SATTL); Autonomous Situational Awareness Technology; and Protected Tactical Field System Demo (PTFSD). These projects involved interoperability in cooperative R&D ventures with these Allies, Major Non-NATO Allies and Strategic Partners: Australia, France, Germany, Republic of Korea, Japan, Norway, United Kingdom, Canada, Spain, Singapore, and Sweden

FY 2020 OCO Plans:
N/A

FY 2019 to FY 2020 Increase/Decrease Statement:
The NATO Coop R&D Program experienced an eighty percent increase in project applications for funding. The increase in project applications coupled with budget constraints limited the number of selected projects, no project received the full funding they requested allowing additional projects to be selected. Some projects with vital non-traditional strategic partners were not selected because of the limited budget. The NATO Coop R&D Program's projected budget is insufficient to sustain the programs' continued popularity, thereby inhibiting growth

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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|--|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0603790F / NATO Research and Development |
|--|---|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|---------|---------|--------------|-------------|---------------|
| into key strategic areas. This program plays a vital role by mitigating critical funding capability gaps and is also a key determinant is accelerating the fielding of innovating technologies to the Warfighter. | | | | | |
| Accomplishments/Planned Programs Subtotals | 3.710 | 2.305 | 4.955 | 0.000 | 4.955 |

D. Other Program Funding Summary (\$ in Millions)
N/A

Remarks

E. Acquisition Strategy

A principal goal of the NATO Cooperative R&D program is to effectively utilize the aggregate resources invested by the US and our allies in air, space, and cyber R&D. This program element provides the critical funding incentive needed to pursue air, space and cyber related International Cooperative Research Development and Acquisition (ICRD&A) agreements and helps to (a) leverage USAF and allied resources through cost sharing and economies of scale; (b) exploit the best US and allied technologies for equipping coalition forces; (c) demonstrate areas of commonality or interoperability with our allies; and (d) accelerate the availability of defense technology and systems. Candidate projects are reviewed against USAF goals, DoD objectives, and warfighter needs prior to being approved. An international agreement defining project objectives, responsibilities and costs is required prior to release of funds. To obtain these funds and ensure service commitment, projects are selected from existing or new RDT&E programs funded in the Future Years Defense Plan (FYDP). Project offices must show matching funds and contributions from associated program elements and equitable allied funding. As appropriate, funding responsibility for out-year requirements and follow-on efforts are transferred to the project office and associated program elements. Any new contracts are awarded after full and open competition.

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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| Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force | | | | | | | | | | | | Date: February 2019 | | | |
|---|------------------------|--------------------------------|-------------|---|------------|---------|------------|------------------------|------------|-------------|------------|---------------------|------------------|------------|--------------------------|
| Appropriation/Budget Activity | | | | R-1 Program Element (Number/Name) | | | | Project (Number/Name) | | | | | | | |
| 3600 / 4 | | | | PE 0603790F / NATO Research and Development | | | | 64NATO / Nato Coop R&D | | | | | | | |
| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | | | |
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | Target Value of Contract |
| NATO Coop R&D (International Research Projects) | Various | Various : NV | - | 2.674 | Feb 2018 | 1.125 | Feb 2019 | 3.468 | Feb 2020 | 0.000 | | 3.468 | Continuing | Continuing | - |
| Subtotal | | | - | 2.674 | | 1.125 | | 3.468 | | 0.000 | | 3.468 | Continuing | Continuing | N/A |
| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | | | |
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | Target Value of Contract |
| NATO Coop R&D (International Research Projects) | Various | Various : NV | - | 1.036 | Feb 2018 | 1.180 | Feb 2019 | 1.487 | Feb 2020 | 0.000 | | 1.487 | Continuing | Continuing | - |
| Subtotal | | | - | 1.036 | | 1.180 | | 1.487 | | 0.000 | | 1.487 | Continuing | Continuing | N/A |
| Project Cost Totals | | | - | 3.710 | | 2.305 | | 4.955 | | 0.000 | | 4.955 | Continuing | Continuing | N/A |
| Remarks | | | | | | | | | | | | | | | |

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603790F / NATO Research and Development | Project (Number/Name) 64NATO / Nato Coop R&D |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|--|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| NATO Coop R&D | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FY20 ICR&D Projects - Call Letter | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FY20 ICR&D Projects - nomination package development | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FY20 ICR&D Projects - Review panel | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FY20 ICR&D Projects - Coordination of review panel results | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FY20 ICR&D Approved Project Letter to the MAJCOMs | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FY20 ICR&D Projects - Agreement development, negotiations, and signature | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FY20 ICR&D Projects - RDTE cooperative project work | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603790F / NATO Research and Development | Project (Number/Name) 64NATO / Nato Coop R&D |

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| NATO Coop R&D | | | | |
| FY20 ICR&D Projects - Call Letter | 2 | 2019 | 3 | 2019 |
| FY20 ICR&D Projects - nomination package development | 2 | 2019 | 3 | 2019 |
| FY20 ICR&D Projects - Review panel | 3 | 2019 | 3 | 2019 |
| FY20 ICR&D Projects - Coordination of review panel results | 4 | 2019 | 4 | 2019 |
| FY20 ICR&D Approved Project Letter to the MAJCOMs | 4 | 2019 | 4 | 2019 |
| FY20 ICR&D Projects - Agreement development, negotiations, and signature | 1 | 2019 | 2 | 2020 |
| FY20 ICR&D Projects - RDTE cooperative project work | 1 | 2019 | 2 | 2020 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|--|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0603851F / <i>Intercontinental Ballistic Missile - Dem/Val</i> |
|--|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 27.424 | 32.356 | 44.109 | 0.000 | 44.109 | 65.582 | 66.944 | 68.165 | 9.896 | Continuing | Continuing |
| 641020: <i>ICBM Guidance Applications</i> | - | 0.486 | 5.659 | 5.184 | 0.000 | 5.184 | 7.887 | 8.155 | 8.395 | 0.000 | Continuing | Continuing |
| 641021: <i>ICBM Propulsion Applications</i> | - | 0.323 | 9.701 | 6.849 | 0.000 | 6.849 | 6.967 | 7.111 | 7.241 | 7.372 | Continuing | Continuing |
| 641022: <i>ICBM Reentry Vehicle Applications</i> | - | 24.543 | 12.720 | 24.439 | 0.000 | 24.439 | 39.776 | 40.186 | 40.554 | 0.000 | Continuing | Continuing |
| 641024: <i>ICBM Command & Control (C2) Applications</i> | - | 0.971 | 1.365 | 3.713 | 0.000 | 3.713 | 6.960 | 7.417 | 7.826 | 0.000 | Continuing | Continuing |
| 644209: <i>Long Range Planning (LRP)</i> | - | 1.101 | 2.911 | 3.924 | 0.000 | 3.924 | 3.992 | 4.075 | 4.149 | 2.524 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

This program ensures a responsive design and development engineering infrastructure to address emerging issues and technology insertion/technology application on legacy Intercontinental Ballistic Missile (ICBM), future strategic systems/capability beyond the Ground Based Strategic Deterrent (GBSD) baseline, and other common strategic deterrent mission areas to develop enhanced multi-use capabilities. The ICBM Dem/Val program will provide technology maturation and risk reduction activities to support Minuteman (MM) III sustainment, MM III to GBSD transition, and future ICBM systems development. ICBM Dem/Val conducts advanced component development and prototyping to validate emerging strategic missile technologies and future upgrades to the baseline Ground Based Strategic Deterrent, currently in development through a low risk, technologically-mature acquisition strategy. Efforts will identify methods to improve system performance, develop potential future RV designs, mitigate evolving threats, reduce life cycle costs, develop/expand modeling/simulation and experimental platforms for weapon qualification activities, improve nuclear safety and surety, and ensure both viability and durability of strategic missile systems.

Budget increase from FY19 to FY20 largely due to \$9.5M mark in FY19 for 'unjustified growth.' Average funding for ICBM Dem/Val between 1995 to 2018 was \$51.020M per year for the purpose of developing technologies, reducing lifecycle costs, reducing risk to the ICBM weapon system, and maintaining industry base. After ramping down to avoid duplication of effort with GBSD between FY16-18, ICBM Dem/Val began expanding efforts again in FY19.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver ICBM Dem/Val capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, 0605833F, and 0605898F.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0603851F / <i>Intercontinental Ballistic Missile - Dem/Val</i> |
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As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 10.736 | 41.856 | 44.109 | 0.000 | 44.109 |
| Current President's Budget | 27.424 | 32.356 | 44.109 | 0.000 | 44.109 |
| Total Adjustments | 16.688 | -9.500 | 0.000 | 0.000 | 0.000 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | -9.500 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 20.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -1.001 | 0.000 | | | |
| • Other Adjustments | -2.311 | 0.000 | 0.000 | 0.000 | 0.000 |

Congressional Add Details (\$ in Millions, and Includes General Reductions)

Project: 641022: *ICBM Reentry Vehicle Applications*

Congressional Add: *Program increase*

Congressional Add Subtotals for Project: 641022

Congressional Add Totals for all Projects

| | FY 2018 | FY 2019 |
|--|----------------|----------------|
| | 20.000 | 0.000 |
| | 20.000 | 0.000 |
| | 20.000 | 0.000 |

Change Summary Explanation

FY 2018 funding reflects a Congressional Add of \$20.000 million for the Rocket System Launch Program (RSLP).

FY 2018 funding reflects a \$2.311 million adjustment for Federally Funded Research and Development Centers (FFRDC) and a Small Business Innovation Research (SBIR) adjustment of \$1.001 million.

FY 2019 funding reflects a Congressionally directed reduction of \$9.500 million for "unjustified growth."

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|---|--------------------|----------------|----------------|---------------------|---|----------------------|----------------|----------------|--|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 4 | | | | | R-1 Program Element (Number/Name) PE 0603851F / <i>Intercontinental Ballistic Missile - Dem/Val</i> | | | | Project (Number/Name) 641020 / <i>ICBM Guidance Applications</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 641020: <i>ICBM Guidance Applications</i> | - | 0.486 | 5.659 | 5.184 | 0.000 | 5.184 | 7.887 | 8.155 | 8.395 | 0.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

The Guidance Applications Program (GAP) ensures the development of strategic capability in response to the Nuclear Posture Review, recommendations of the United States Strategic Command (USSTRATCOM) Strategic Advisory Group, USSTRATCOM Commander Guidance, and the Defense Science Board Task Force on Nuclear Deterrence. The program studies and assesses both legacy and future (non-GBSD baseline) ICBM Guidance System technology applications. Efforts are focused on current and future requirements and technologies, reduced life cycle costs, and increased nuclear surety and safety. Activities leverage the efforts of the Science and Technology community and are coordinated with the Navy strategic applications program to enhance synergy and avoid duplication. Key elements include developing responsive technologies with common applications for future strategic guidance capabilities. This program also includes any needed nuclear surety and certification and system vulnerability assessments.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| Title: Guidance Applications Program | 0.486 | 5.659 | 5.184 |
| Description: Develop and mature advanced technologies and concepts to support future requirements. | | | |
| FY 2019 Plans: | | | |
| <ul style="list-style-type: none"> • Continue the evaluation and testing of strategic and space guidance-related commodities within market for potential use in a future (non-GBSD baseline) strategic guidance system; coordinate with the Navy strategic applications program. • Continue development of a Micro-Electro Mechanical System for potential insertion into the Path Length Module. • Expand the Strategic Guidance Hardware independent validation & verification capability to include multi-G force environment and other various environments; perform Guidance analyses and Guidance technology studies. • Identify emerging technologies for future strategic grade gyros and accelerometers to ensure appropriate test capability development. • Rapidly respond to evolving warfighter priorities and emerging requirements. | | | |
| FY 2020 Plans: | | | |
| <ul style="list-style-type: none"> • Continue the evaluation and testing of strategic and space guidance-related commodities within market for potential use in a future (non-GBSD baseline) strategic guidance system; coordinate with the Navy strategic applications program. • Continue development of a Micro-Electro Mechanical System for potential insertion into the Path Length Module. • Continue expanding the Strategic Guidance Hardware independent validation & verification capability to include multi-G force environment and other various environments; perform Guidance analyses and Guidance technology studies. | | | |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603851F / <i>Intercontinental Ballistic Missile - Dem/Val</i> | Project (Number/Name) 641020 / <i>ICBM Guidance Applications</i> |

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| <ul style="list-style-type: none"> Continue evaluating emerging technologies for future strategic grade gyros and accelerometers to ensure appropriate test capability development. Rapidly respond to evolving warfighter priorities and emerging requirements. <p>FY 2019 to FY 2020 Increase/Decrease Statement: Decrease due to ramp-down towards completion of Micro-Electronic Mechanical Path Length Module effort.</p> | | | |
| Accomplishments/Planned Programs Subtotals | 0.486 | 5.659 | 5.184 |

C. Other Program Funding Summary (\$ in Millions)

| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020 Base</u> | <u>FY 2020 OCO</u> | <u>FY 2020 Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To Complete</u> | <u>Total Cost</u> |
|------------------------------------|----------------|----------------|---------------------|--------------------|----------------------|----------------|----------------|----------------|----------------|-------------------------|-------------------|
| • RDTE 04 PE 0605230F: <i>GBSD</i> | 221.536 | 414.441 | 570.373 | - | 570.373 | 1,527.545 | 2,540.300 | 3,039.900 | 3,078.800 | Continuing | Continuing |

Remarks

D. Acquisition Strategy

Accomplish studies, analyses, concept development and engineering; efforts will be conducted using contracting strategies deemed most appropriate, generally using competitive contracts and/or other obligating documentation considered most appropriate by obligating and performing agencies involved. Current effort deliverables to include strategic grade guidance prototypes to support multiple ongoing Air Force initiatives.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603851F / <i>Intercontinental Ballistic Missile - Dem/Val</i> | Project (Number/Name) 641020 / <i>ICBM Guidance Applications</i> |
|--|---|--|

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| GAP Micro-Electronic Module System | Various | Various : Various | - | 0.214 | Jan 2018 | 2.047 | Jan 2019 | 0.569 | Jan 2020 | - | | 0.569 | Continuing | Continuing | - |
| GAP Emerging Strategic Instrument | Various | Various : Various | - | 0.237 | Jan 2018 | 3.392 | Jan 2019 | 4.410 | Jan 2020 | - | | 4.410 | Continuing | Continuing | - |
| Subtotal | | | - | 0.451 | | 5.439 | | 4.979 | | - | | 4.979 | Continuing | Continuing | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| GAP, Program Management Administrative Support Services | C/Various | Various : Various | - | 0.035 | Jan 2018 | 0.220 | Jan 2019 | 0.205 | Jan 2020 | - | | 0.205 | Continuing | Continuing | - |
| Subtotal | | | - | 0.035 | | 0.220 | | 0.205 | | - | | 0.205 | Continuing | Continuing | N/A |

| Project Cost Totals | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|--------------------|----------------|----------------|---------------------|--------------------|----------------------|-------------------------|-------------------|---------------------------------|
| | - | 0.486 | 5.659 | 5.184 | - | 5.184 | Continuing | Continuing | N/A |

Remarks

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603851F / <i>Intercontinental Ballistic Missile - Dem/Val</i> | Project (Number/Name) 641020 / <i>ICBM Guidance Applications</i> |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| GAP | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GAP Micro-Electronic Module System | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GAP Emerging Strategic Instrument Technology Requirements | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603851F / <i>Intercontinental Ballistic Missile - Dem/Val</i> | Project (Number/Name) 641020 / <i>ICBM Guidance Applications</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|---|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| GAP | | | | |
| GAP Micro-Electronic Module System | 2 | 2018 | 2 | 2020 |
| GAP Emerging Strategic Instrument Technology Requirements | 2 | 2018 | 4 | 2023 |

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|---|--------------------|----------------|----------------|---------------------|---|----------------------|----------------|----------------|--|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 4 | | | | | R-1 Program Element (Number/Name) PE 0603851F / <i>Intercontinental Ballistic Missile - Dem/Val</i> | | | | Project (Number/Name) 641021 / <i>ICBM Propulsion Applications</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 641021: <i>ICBM Propulsion Applications</i> | - | 0.323 | 9.701 | 6.849 | 0.000 | 6.849 | 6.967 | 7.111 | 7.241 | 7.372 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

The Propulsion Applications Program (PAP) develops and assesses strategic propulsion system technology applications for both legacy and future (non-GBSD baseline) systems through projects exploring improvements and/or alternatives to current propulsion systems, conducting studies assessing application of new technologies to meet future common propulsion systems requirements, and assessing opportunities for applying common materials and technology between the ICBM, submarine-launched ballistic missile (SLBM) propulsion systems, and other rocket motor propulsion capabilities. Efforts are focused on current and future requirements and technologies, reduced life cycle costs, and increased nuclear surety, safety, certification and system vulnerability assessments.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| Title: Propulsion Applications Program | 0.323 | 9.701 | 6.849 |
| Description: Assess, develop, evaluate, and demonstrate common solid and liquid propulsion technology and manufacturing leading up to a static fire and test of strategic propulsion systems; develop capability and explore improvements to current and future propulsion systems; and support the research and development industrial base and critical infrastructure. | | | |
| FY 2019 Plans: | | | |
| <ul style="list-style-type: none"> • Complete trade studies and risk reduction of components and subsystem propulsion technologies for future ICBM program insertion. • Initiate propellant studies to develop propellant formulations for future ICBM program insertion. • Initiate propulsion systems studies to develop alternative propulsion systems for future ICBM program insertion. • Initiate sensor technology study to develop and enhance propulsion systems management. • Rapidly respond to evolving warfighter priorities and emerging requirements. • Complete Propulsion Nuclear Environment Study. | | | |
| FY 2020 Plans: | | | |
| <ul style="list-style-type: none"> • Continue propellant studies to develop propellant formulations for future ICBM program insertion. • Continue propulsion systems studies to develop alternative propulsion systems for future ICBM program insertion. • Continue sensor technology study to develop and enhance propulsion systems management. • Rapidly respond to evolving warfighter priorities and emerging requirements. | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: | | | |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603851F / <i>Intercontinental Ballistic Missile - Dem/Val</i> | Project (Number/Name) 641021 / <i>ICBM Propulsion Applications</i> |

| | | | |
|---|----------------|----------------|----------------|
| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
| Decrease due to completion of trade studies and risk reduction of components and subsystem propulsion technologies. | | | |
| Accomplishments/Planned Programs Subtotals | 0.323 | 9.701 | 6.849 |

C. Other Program Funding Summary (\$ in Millions)

| Line Item | FY 2018 | FY 2019 | FY 2020 | FY 2020 | FY 2020 | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To | |
|------------------------------------|---------|---------|---------|---------|---------|-----------|-----------|-----------|-----------|------------|------------|
| | | | Base | OCO | Total | | | | | Complete | Total Cost |
| • RDTE 04 PE 0605230F: <i>GBSD</i> | 221.536 | 414.441 | 570.373 | - | 570.373 | 1,527.545 | 2,540.300 | 3,039.900 | 3,078.800 | Continuing | Continuing |

Remarks

D. Acquisition Strategy

Studies, analyses, limited engineering, hardware development and/or testing will be accomplished; efforts will be conducted using contracting strategies deemed most appropriate, generally using competitive contracts and/or other obligating documentation considered most appropriate by obligating and performing agencies involved. Current effort deliverables include alternate propulsion technology prototypes and low toxic hazard propellants that can be utilized in a variety of Air Force applications.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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|--|---|--|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603851F / <i>Intercontinental Ballistic Missile - Dem/Val</i> | Project (Number/Name) 641021 / <i>ICBM Propulsion Applications</i> |
|--|---|--|

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| PAP Trade Studies/Risk Reduction | MIPR | SNL : Kirtland AFB, NM | - | 0.138 | Jan 2018 | - | | - | | - | | - | Continuing | Continuing | - |
| PAP Propulsion Technology HPM Parametric Study | MIPR | SNL : Albuquerque, NM | - | 0.103 | Oct 2017 | - | | - | | - | | - | Continuing | Continuing | - |
| PAP Propulsion Nuclear Environment Study | MIPR | SNL : Albuquerque, NM | - | 0.064 | Oct 2017 | - | | - | | - | | - | Continuing | Continuing | - |
| PAP Propellant Studies | Various | Various : Various | - | - | | 1.900 | Jan 2019 | 2.866 | Jan 2020 | - | | 2.866 | Continuing | Continuing | - |
| PAP Alternate Propulsion Systems Studies | Various | Various : Various | - | - | | 2.400 | Apr 2019 | 1.500 | Apr 2020 | - | | 1.500 | Continuing | Continuing | - |
| PAP Sensor Technology Studies | Various | Various : Various | - | - | | 5.000 | Jan 2019 | 2.200 | Jan 2020 | - | | 2.200 | Continuing | Continuing | - |
| Subtotal | | | - | 0.305 | | 9.300 | | 6.566 | | - | | 6.566 | Continuing | Continuing | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| PAP Program Management Administration | Various | Various : Various | - | 0.018 | Jan 2018 | 0.401 | Jan 2019 | 0.283 | Jan 2020 | - | | 0.283 | Continuing | Continuing | - |
| Subtotal | | | - | 0.018 | | 0.401 | | 0.283 | | - | | 0.283 | Continuing | Continuing | N/A |

| | | | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|--|--|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|
| Project Cost Totals | | | - | 0.323 | 9.701 | 6.849 | - | 6.849 | Continuing | Continuing | N/A |

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603851F / <i>Intercontinental Ballistic Missile - Dem/Val</i> | Project (Number/Name) 641021 / <i>ICBM Propulsion Applications</i> |

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
|--|--|
| PAP | |
| PAP Trade Studies/Risk Reduction | |
| PAP Propulsion Technology HPM Parametric Study | |
| PAP Propulsion Nuclear Environment Study | |
| PAP Propellant Studies | |
| PAP Alternate Propulsion Systems Studies | |
| PAP Sensor Technology Studies | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603851F / <i>Intercontinental Ballistic Missile - Dem/Val</i> | Project (Number/Name) 641021 / <i>ICBM Propulsion Applications</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| PAP | | | | |
| PAP Trade Studies/Risk Reduction | 1 | 2018 | 2 | 2019 |
| PAP Propulsion Technology HPM Parametric Study | 1 | 2018 | 2 | 2019 |
| PAP Propulsion Nuclear Environment Study | 1 | 2018 | 2 | 2019 |
| PAP Propellant Studies | 2 | 2019 | 2 | 2021 |
| PAP Alternate Propulsion Systems Studies | 3 | 2019 | 3 | 2022 |
| PAP Sensor Technology Studies | 2 | 2019 | 2 | 2021 |

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|---|--------------------|----------------|----------------|---------------------|---|----------------------|----------------|----------------|---|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 4 | | | | | R-1 Program Element (Number/Name) PE 0603851F / <i>Intercontinental Ballistic Missile - Dem/Val</i> | | | | Project (Number/Name) 641022 / <i>ICBM Reentry Vehicle Applications</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 641022: <i>ICBM Reentry Vehicle Applications</i> | - | 24.543 | 12.720 | 24.439 | 0.000 | 24.439 | 39.776 | 40.186 | 40.554 | 0.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

The Reentry Vehicle Applications Program (RVAP) ensures the ICBM force is equipped with the safest, most reliable, most survivable Reentry Systems, and explores options for common, multi-mission capabilities. The program enables a responsive engineering infrastructure by developing modeling/simulation and ground and flight test platforms to support Reentry System qualifications. The program ensures the availability of long-lead components and materials while identifying life cycle cost reduction methods. In addition, the program matures and tests advanced Reentry System technologies and designs to meet future requirements. This includes studying and assessing technology applications relevant to Mk12A, Mk21, Mk21A and future ICBM Reentry Systems. The program leverages investments by the Science & Technology community and Navy reentry systems applications program. Testing may occur on a space available basis on Air Force and Navy Force Development Evaluation (FDE) flights.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| Title: Reentry Vehicle Applications Program | 4.543 | 12.720 | 24.439 |
| Description: Mature, evaluate, and test reentry system materials, technologies, and vehicles including modeling/simulation, and ground and flight test platforms for use in current and future strategic applications. | | | |
| FY 2019 Plans: | | | |
| <ul style="list-style-type: none"> • Continue and initiate new risk reduction studies for RV nosetips to mature and evaluate future heatshield development, carbon phenolic replacements, modeling and simulation programs, manufacturing capabilities, reentry system technologies, threat development analysis and countermeasure technologies/strategies, and inform future RV capabilities. • Complete thermal protection system testing and studies. • Conduct materials development, prototyping, and test. • Develop new modeling/simulation and flight test platforms for future weapon qualification activities. • Continue supporting the Joint Technology Demonstrator. • Continue supporting the Air Force and NNSA Demonstrator Initiative. • Develop advanced sensors for surveillance and flight test diagnostics. • Continue study for future RV concepts. • Continue materials test platform on orbital vehicle. • Continue and initiate new aeroshell modification and development studies. | | | |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603851F / <i>Intercontinental Ballistic Missile - Dem/Val</i> | Project (Number/Name) 641022 / <i>ICBM Reentry Vehicle Applications</i> |

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| <ul style="list-style-type: none"> • Rapidly respond to evolving warfighter priorities and emerging requirements. <p>FY 2020 Plans:</p> <ul style="list-style-type: none"> • Continue and initiate new risk reduction studies for RV nosetips to mature and evaluate future heatshield development, carbon phenolic replacements, modeling and simulation programs, manufacturing capabilities, reentry system technologies, threat development analysis and countermeasure technologies/strategies, and inform future RV capabilities. • Conduct materials development, prototyping, and test. • Develop new modeling/simulation and flight test platforms for future weapon qualification activities. • Continue supporting the Joint Technology Demonstrator. • Continue supporting the Air Force and NNSA Demonstrator Initiative. • Develop advanced sensors for surveillance and flight test diagnostics. • Continue study for future RV concepts. • Continue materials test platform on orbital vehicle. • Continue aeroshell modification and development studies. • Rapidly respond to evolving warfighter priorities and emerging requirements. <p>FY 2019 to FY 2020 Increase/Decrease Statement: Increase due to nosetip materials, prototyping, and sensors studies effort ramp up.</p> | | | |
| Accomplishments/Planned Programs Subtotals | 4.543 | 12.720 | 24.439 |

| | FY 2018 | FY 2019 |
|--|----------------|----------------|
| Congressional Add: Program increase | 20.000 | 0.000 |
| FY 2018 Accomplishments: Conducted propulsion and solid rocket motor studies (RSLP) | | |
| FY 2019 Plans: N/A | | |
| Congressional Adds Subtotals | 20.000 | 0.000 |

| C. Other Program Funding Summary (\$ in Millions) | | | | | | | | | | | |
|--|----------------|----------------|---------------------|--------------------|----------------------|----------------|----------------|----------------|----------------|-------------------------|-------------------|
| Line Item | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| • RDTE 04 PE 0605230F: <i>GBSD</i> | 221.536 | 414.441 | 570.373 | - | 570.373 | 1,527.545 | 2,540.300 | 3,039.900 | 3,078.800 | Continuing | Continuing |

Remarks

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603851F / <i>Intercontinental Ballistic Missile - Dem/Val</i> | Project (Number/Name) 641022 / <i>ICBM Reentry Vehicle Applications</i> |

D. Acquisition Strategy

Studies, analyses, limited engineering, and pre-prototype hardware development will be accomplished; efforts will be conducted using contracting strategies deemed most appropriate, generally using competitive contracts and/or other obligating documentation considered most appropriate by obligating and performing agencies involved. Current effort deliverables include various technologies for ICBM re-entry vehicles including nosetip materials, modeling and simulation software, alternate high temperature materials, and methodologies for modifying aeroshells.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|---|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603851F / <i>Intercontinental Ballistic Missile - Dem/Val</i> | Project (Number/Name) 641022 / <i>ICBM Reentry Vehicle Applications</i> |
|--|---|---|

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---------------------------------|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| RVAP Support | C/FFP | BAE Systems : Clearfield, UT | - | 0.143 | Mar 2018 | 0.515 | Mar 2019 | 1.000 | Mar 2020 | - | | 1.000 | Continuing | Continuing | - |
| Subtotal | | | - | 0.143 | | 0.515 | | 1.000 | | - | | 1.000 | Continuing | Continuing | N/A |

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Propulsion and Solid Rocket Motor Studies (RSLP) | MIPR | AFRL; RSLP : Albuquerque, NM | - | 20.000 | Jan 2019 | - | | - | | - | | - | Continuing | Continuing | - |
| RVAP Joint Technology Demonstrator | MIPR | SNL and LLNL : Various | - | 1.000 | Jan 2018 | 2.300 | Jan 2019 | 1.663 | Jan 2020 | - | | 1.663 | Continuing | Continuing | - |
| RVAP TPS Testing and Analysis | Various | Various : Various | - | 0.088 | Jan 2018 | - | | - | | - | | - | Continuing | Continuing | - |
| RVAP Flight Materials Test Platform | MIPR | SAF/FMBIB : Various | - | 0.500 | Jul 2018 | 0.500 | Jul 2019 | 0.500 | Jul 2020 | - | | 0.500 | Continuing | Continuing | - |
| RVAP Modeling and Simulation Programs | Various | Various : Various | - | - | | 0.300 | Feb 2019 | 0.460 | Feb 2020 | - | | 0.460 | Continuing | Continuing | - |
| RVAP Nosetip Studies | Various | Various : Various | - | 0.454 | Apr 2018 | 2.000 | Apr 2019 | 4.605 | Apr 2020 | - | | 4.605 | Continuing | Continuing | - |
| RVAP Advanced Concept Studies | Various | Various : Various | - | 0.087 | Nov 2017 | 2.655 | Jan 2019 | 5.365 | Jan 2020 | - | | 5.365 | Continuing | Continuing | - |
| RVAP Air Force and NNSA Demonstrator Initiative | MIPR | SNL and LLNL : Various | - | 1.312 | Jan 2018 | 2.500 | Jan 2019 | 8.198 | Jan 2020 | - | | 8.198 | Continuing | Continuing | - |
| RVAP Aeroshell Studies | Various | Various : Various | - | 0.502 | Jan 2018 | 0.950 | Jan 2019 | 1.535 | Jan 2020 | - | | 1.535 | Continuing | Continuing | - |
| RVAP Sensors Studies | Various | Various : Various | - | 0.295 | Jan 2018 | 0.500 | Jan 2019 | 0.588 | | - | | 0.588 | Continuing | Continuing | - |
| Subtotal | | | - | 24.238 | | 11.705 | | 22.914 | | - | | 22.914 | Continuing | Continuing | N/A |

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| Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force | | | | | | | | | | | Date: February 2019 | | | | |
| Appropriation/Budget Activity 3600 / 4 | | | | | | R-1 Program Element (Number/Name) PE 0603851F / <i>Intercontinental Ballistic Missile - Dem/Val</i> | | | | | Project (Number/Name) 641022 / <i>ICBM Reentry Vehicle Applications</i> | | | | |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | | | |
|---|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | Target Value of Contract |
| RVAP Program Management Administration | Various | Various : Various | - | 0.162 | Jan 2018 | 0.500 | Jan 2019 | 0.525 | Jan 2020 | - | | 0.525 | Continuing | Continuing | - |
| Subtotal | | | - | 0.162 | | 0.500 | | 0.525 | | - | | 0.525 | Continuing | Continuing | N/A |
| Project Cost Totals | | | - | 24.543 | | 12.720 | | 24.439 | | - | | 24.439 | Continuing | Continuing | N/A |

Remarks
 Due to limited funding in FY19, some requirements were deferred to FY20 causing a dramatic ramp-up in FY20 efforts.

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603851F / <i>Intercontinental Ballistic Missile - Dem/Val</i> | Project (Number/Name) 641022 / <i>ICBM Reentry Vehicle Applications</i> |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| RVAP | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Propulsion and Rocket Motor Studies | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RVAP Joint Technology Demonstrator | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RVAP TPS Testing and Analysis | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RVAP Flight Materials Test Platform | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RVAP Modeling and Simulation Programs | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RVAP Nosetip Studies | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RVAP Advanced Concept Studies | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RVAP Air Force and NNSA Demonstrator Initiative | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RVAP Aeroshell Studies | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RVAP Sensors Studies | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603851F / <i>Intercontinental Ballistic Missile - Dem/Val</i> | Project (Number/Name) 641022 / <i>ICBM Reentry Vehicle Applications</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|---|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| RVAP | | | | |
| Propulsion and Rocket Motor Studies | 2 | 2018 | 4 | 2019 |
| RVAP Joint Technology Demonstrator | 1 | 2018 | 3 | 2021 |
| RVAP TPS Testing and Analysis | 1 | 2018 | 2 | 2019 |
| RVAP Flight Materials Test Platform | 4 | 2018 | 4 | 2022 |
| RVAP Modeling and Simulation Programs | 2 | 2019 | 4 | 2023 |
| RVAP Nosetip Studies | 3 | 2018 | 4 | 2022 |
| RVAP Advanced Concept Studies | 1 | 2018 | 2 | 2021 |
| RVAP Air Force and NNSA Demonstrator Initiative | 2 | 2018 | 4 | 2023 |
| RVAP Aeroshell Studies | 1 | 2018 | 4 | 2024 |
| RVAP Sensors Studies | 2 | 2018 | 4 | 2019 |

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|---|--------------------|----------------|----------------|---------------------|---|----------------------|----------------|----------------|--|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 4 | | | | | R-1 Program Element (Number/Name) PE 0603851F / <i>Intercontinental Ballistic Missile - Dem/Val</i> | | | | Project (Number/Name) 641024 / <i>ICBM Command & Control (C2) Applications</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 641024: <i>ICBM Command & Control (C2) Applications</i> | - | 0.971 | 1.365 | 3.713 | 0.000 | 3.713 | 6.960 | 7.417 | 7.826 | 0.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

The Command and Control Applications Program (C2AP) supports ICBM weapon system connectivity to the President and National Command Authorities. C2AP studies and assesses both legacy and future (non-GBSD baseline) C2 System technology applications. C2AP evaluates and develops assured, survivable, and secure communications and battlespace awareness between the missile Launch Control Centers and Launch Facilities essential for mission execution. Efforts include identifying and developing current and future technologies, as well as concepts that exploit state-of-the-art communications and information transfer techniques to both current and future ICBM systems. Products include studies, demonstrations and tests such as ICBM Weapon System C2 (WSC2) architectures, networks, and systems to meet nuclear command and control requirements.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| Title: Command and Control Application Program | 0.971 | 1.365 | 3.713 |
| Description: Examine and develop concepts for transforming ICBM WSC2 to meet current and future requirements. | | | |
| FY 2019 Plans: | | | |
| <ul style="list-style-type: none"> • Complete Electronic Technical Orders prototype for ICBM platforms. • Continue Battlespace Awareness studies. • Rapidly respond to evolving warfighter priorities and emerging requirements. | | | |
| FY 2020 Plans: | | | |
| <ul style="list-style-type: none"> • Initiate high frequency radio study to meet current and future system requirements. • Initiate cyber studies of technologies to improve weapon system command and control systems management. • Continue Battlespace Awareness studies. • Rapidly respond to evolving warfighter priorities and emerging requirements. | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: | | | |
| Increase due to beginning high-frequency and cyber studies. | | | |
| Accomplishments/Planned Programs Subtotals | | | 3.713 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603851F / <i>Intercontinental Ballistic Missile - Dem/Val</i> | Project (Number/Name) 641024 / <i>ICBM Command & Control (C2) Applications</i> |

C. Other Program Funding Summary (\$ in Millions)

| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> <u>Base</u> | <u>FY 2020</u> <u>OCO</u> | <u>FY 2020</u> <u>Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To</u> <u>Complete</u> | <u>Total Cost</u> |
|------------------------------------|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|
| • RDTE 04 PE 0605230F: <i>GBSD</i> | 221.536 | 414.441 | 570.373 | - | 570.373 | 1,527.545 | 2,540.300 | 3,039.900 | 3,078.800 | Continuing | Continuing |

Remarks

D. Acquisition Strategy

Studies, analyses, limited engineering, will be accomplished; efforts will be conducted using contracting strategies deemed most appropriate, generally using competitive contracts and/or other obligating documentation considered most appropriate by obligating and performing agencies involved. Current effort deliverables to include electronic technical order prototype and validation of a Navy-developed system for ICBM battlespace awareness needs.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603851F / <i>Intercontinental Ballistic Missile - Dem/Val</i> | Project (Number/Name) 641024 / <i>ICBM Command & Control (C2) Applications</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| C2AP | | | | |
| C2AP Electronic Technical Orders | 3 | 2018 | 3 | 2019 |
| C2AP Battlespace Awareness Studies | 2 | 2018 | 2 | 2020 |
| C2AP High Frequency Radio Technology Study | 2 | 2020 | 3 | 2022 |
| C2AP Cyber Technologies | 2 | 2020 | 4 | 2022 |

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|---|--------------------|----------------|----------------|---------------------|---|----------------------|----------------|----------------|---|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 4 | | | | | R-1 Program Element (Number/Name) PE 0603851F / <i>Intercontinental Ballistic Missile - Dem/Val</i> | | | | Project (Number/Name) 644209 / <i>Long Range Planning (LRP)</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 644209: <i>Long Range Planning (LRP)</i> | - | 1.101 | 2.911 | 3.924 | 0.000 | 3.924 | 3.992 | 4.075 | 4.149 | 2.524 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

Long Range Planning (LRP) effort identifies and analyzes potential modifications to current and future Intercontinental Ballistic Missile (ICBM) Weapon Systems required to meet objectives relative to long-term sustainment, technology insertion, battle space awareness, employment, force structure and future systems. The studies will focus on system supportability, operability, reliability, innovation and maintainability. Options/concepts generated by these studies are evaluated for feasibility, system impacts, and cost. The LRP also lays the groundwork for analysis supporting future weapon systems development and deployment. Pre-milestone activities may be conducted for current or future ICBM weapon systems to include entry criteria for milestone activities.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| Title: Long Range Planning | 1.101 | 2.911 | 3.924 |
| Description: Analyze, study and plan current and future ICBM activities to meet requirements for long-term sustainment, technology insertion, employment force structure and future systems. | | | |
| FY 2019 Plans: | | | |
| <ul style="list-style-type: none"> • Complete sensor array detection study. • Continue to develop designs and production concepts for trusted strategic radiation-hardened advanced microelectronics. • Continue Virtual Instructor Prototype for ICBM Platforms. • Rapidly respond to evolving warfighter priorities and emerging requirements. | | | |
| FY 2020 Plans: | | | |
| <ul style="list-style-type: none"> • Continue to develop designs and production concepts for trusted strategic radiation-hardened advanced microelectronics. • Complete Virtual Instructor Prototype for ICBM Platforms. • Rapidly respond to evolving warfighter priorities and emerging requirements. | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: | | | |
| Increase due to ramp up of trusted strategic radiation-hardened advanced microelectronics effort. | | | |
| Accomplishments/Planned Programs Subtotals | 1.101 | 2.911 | 3.924 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603851F / <i>Intercontinental Ballistic Missile - Dem/Val</i> | Project (Number/Name) 644209 / <i>Long Range Planning (LRP)</i> |

C. Other Program Funding Summary (\$ in Millions)

| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> <u>Base</u> | <u>FY 2020</u> <u>OCO</u> | <u>FY 2020</u> <u>Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To</u> <u>Complete</u> | <u>Total Cost</u> |
|------------------------------------|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|
| • RDTE 04 PE 0605230F: <i>GBSD</i> | 221.536 | 414.441 | 570.373 | - | 570.373 | 1,527.545 | 2,540.300 | 3,039.900 | 3,078.800 | Continuing | Continuing |

Remarks

D. Acquisition Strategy

Analysis will be accomplished; efforts will be conducted using contracting strategies deemed most appropriate, generally using competitive contracts and/or other obligating documentation considered most appropriate by obligating and performing agencies involved.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603851F / <i>Intercontinental Ballistic Missile - Dem/Val</i> | Project (Number/Name) 644209 / <i>Long Range Planning (LRP)</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| LRP | | | | |
| LRP Sensor Array Detection Study | 1 | 2018 | 2 | 2019 |
| LRP VIPr Prototype Development | 3 | 2018 | 1 | 2020 |
| LRP Radiation-Hardened Advanced Microelectronics | 2 | 2018 | 4 | 2023 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0603859F / <i>Pollution Prevention - Dem/Val</i> |
|--|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|-------------------------------------|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 0.002 | 0.200 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| 644852: <i>Pollution Prevention</i> | - | 0.002 | 0.200 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

This project funds R&D activities that demonstrate and prototype alternative weapon system manufacturing, remanufacturing, and maintenance materials and processes that reduce or eliminate hazardous chemicals, materials and waste streams through cost-effective programs and practices, while improving energy efficiency and reducing greenhouse gas emissions. Upon proof of the new process or materials, the resulting product can be transitioned to depot maintenance processes, which results in reduced maintenance costs, reduced depot flow time, and increases asset availability. Specifically, funds target pollution prevention technologies that reduce or eliminate chromium, cadmium, and nickel, as well as reduce or eliminate Hazardous Air Pollutants (HAPS), Volatile Organic Compounds (VOCs), and Class I and II Ozone Depleting Substances (ODS), global warmers and biochemical oxygen demand (BOD) and to increase the use of renewable and alternative fuels.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 0.002 | 0.000 | 0.000 | 0.000 | 0.000 |
| Current President's Budget | 0.002 | 0.200 | 0.000 | 0.000 | 0.000 |
| Total Adjustments | 0.000 | 0.200 | 0.000 | 0.000 | 0.000 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.200 | | | |
| • Other Adjustments | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0603859F / <i>Pollution Prevention - Dem/Val</i> |
|--|---|

Change Summary Explanation

Congressional Add for aviation ground equipment.

C. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|--|---------|---------|---------|
| Title: R&D Activities | 0.002 | 0.200 | 0.000 |
| Description: R&D activities that demonstrate and prototype alternative weapon system manufacturing, remanufacturing, and maintenance materials and processes that reduce or eliminate hazardous chemicals, materials and waste streams through cost-effective programs and practices, while improving energy efficiency and reducing greenhouse gas emissions. | | | |
| FY 2019 Plans: N/A | | | |
| FY 2020 Plans: R&D activities that demonstrate and prototype alternative weapon system manufacturing, remanufacturing, and maintenance materials and processes that reduce or eliminate hazardous chemicals, materials and waste streams through cost-effective programs and practices, while improving energy efficiency and reducing greenhouse gas emissions. | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: No funding in FY 2020 | | | |
| Accomplishments/Planned Programs Subtotals | 0.002 | 0.200 | 0.000 |

D. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

E. Acquisition Strategy

Pollution Prevention activities are level of effort and use time and materials support contracts.

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603859F / Pollution Prevention - Dem/ Val | Project (Number/Name) 644852 / Pollution Prevention |
|--|--|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--------------------------------------|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Air Force Research Lab | Various | Various : TBD | - | 0.002 | Mar 2018 | 0.200 | Mar 2019 | 0.000 | | - | | 0.000 | Continuing | Continuing | - |
| Subtotal | | | - | 0.002 | | 0.200 | | 0.000 | | - | | 0.000 | Continuing | Continuing | N/A |
| Project Cost Totals | | | - | 0.002 | | 0.200 | | 0.000 | | - | | 0.000 | Continuing | Continuing | N/A |

Remarks

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603859F / <i>Pollution Prevention - Dem/Val</i> | Project (Number/Name) 644852 / <i>Pollution Prevention</i> |

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
|------------------------------------|--|
| <i>Pollution Prevention</i> | |
| Requirements ID | |
| Potential Alternatives | |
| Test Plan | |
| Test Report | |
| Demonstration | |
| Final Report | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0603859F / <i>Pollution Prevention - Dem/Val</i> | Project (Number/Name) 644852 / <i>Pollution Prevention</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|------------------------------------|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Pollution Prevention</i> | | | | |
| Requirements ID | 1 | 2018 | 4 | 2019 |
| Potential Alternatives | 1 | 2018 | 4 | 2019 |
| Test Plan | 1 | 2018 | 4 | 2019 |
| Test Report | 1 | 2018 | 4 | 2019 |
| Demonstration | 1 | 2018 | 4 | 2019 |
| Final Report | 1 | 2018 | 4 | 2019 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0604002F / <i>Air Force Weather Services Research</i> |
|--|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 0.000 | 0.000 | 0.772 | 0.000 | 0.772 | 0.870 | 1.002 | 0.804 | 0.832 | 0.000 | 4.280 |
| 643560: <i>AF Weather Services Research</i> | - | 0.000 | 0.000 | 0.772 | 0.000 | 0.772 | 0.870 | 1.002 | 0.804 | 0.832 | 0.000 | 4.280 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | - | - |

Note
 This program, BA 4, PE 0604002F, project 643560, Space Weather Analysis and Forecast Radiation Exposure Model (SWAFS-RadEx), is a new start.
 This program, BA 4, PE 0604002F, project 643560, Space Weather Analysis and Forecast Energetic Charged Particle Hazard Assessment (SWAFS-ECP HAS), is a new start.

In FY2020, a portion of PE 0305111F, Weather Services, Project 672738 efforts were transferred to PE 0604002F, Air Force Weather Services Research, Project 643560 in order to properly align Advanced Component Development and Prototype activities with the correct funding source.

A. Mission Description and Budget Item Justification

This budget activity funds development necessary to evaluate integrated technologies and models for future operationalization into segments of the Air Force Weather Services (AFWS) in support of the 2018 National Defense Strategy (NDS) lines of effort. To improve readiness for a more lethal force, AFWS provides timely, accurate, resilient and relevant environmental information, to include space and terrestrial weather, for global battlespace situational awareness for Air Force (AF), Army, Special Operations Forces (SOF), combatant commands, and other government agencies. AFWS capabilities at home station and deployed provide critical support to the full spectrum of air and space combat operations. AFWS development enhances the lethality, effectiveness, and survivability of AF weapon systems and precision munitions by modernizing capability and seeking the military advantage to accurately predict friendly and foe environmental impacts to optimize mission execution and planning, targeting, weaponeering, battle damage assessment and space systems operations. To strengthen alliances and partnerships, AFWS development efforts integrate DoD, government agency, and commercial and international partner environmental data with AFWS information system equipment for processing, storing, exploiting and disseminating multi-domain weather information for analysis, forecasting, mission integration and greater interoperability. Funding for AFWS development also ensures greater performance and affordability through improvements to architecture and system efficiency, cybersecurity, C4ISR integration, migration to cloud computing, and expanding agile software development practices.

AFWS aligns activities under four capability areas: Weather Data Collection, Weather Data Analysis and Dissemination, Weather Forecasting, and Product Tailoring/Warfighter Applications. This alignment ensures an integrated and systems-oriented approach to program management decisions. A portion of the Weather Forecasting capability is addressed by APPN 3600, BA 04, PE 0604002F, Project 643560- Air Force Weather Services Research.

1. Weather Forecasting provides advanced scientific numerical weather prediction capabilities for automated, high resolution forecast products for mission planning, rehearsal, and execution. Space weather modeling assists in characterizing and forecasting the near-Earth environment to the sun, and enables space weather anomaly

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0604002F / <i>Air Force Weather Services Research</i> |
|--|--|

and space weather impact assessments. Weather Forecasting includes activities for Numerical Weather Modeling (NWM); Weather Services - Live, Virtual, Constructive (WS-LVC), and Space Weather Analysis and Forecast System (SWAFS).

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Current President's Budget | 0.000 | 0.000 | 0.772 | 0.000 | 0.772 |
| Total Adjustments | 0.000 | 0.000 | 0.772 | 0.000 | 0.772 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 0.772 | 0.000 | 0.772 |

Change Summary Explanation

Funding transferred from BA7 to BA4 activity.

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| Title: Space Weather Analysis and Forecast Radiation Exposure Model (SWAFS-RadEx) | - | - | 0.400 |
| Description: SWAFS-RadEx AFRL Analysis of Alternatives (AoA) and Modeling | | | |
| FY 2020 Plans: This is a new start in FY2020. In FY2020, a portion of PE 0305111F, Weather Services, Project 672738 efforts were transferred to PE 0604002F, Air Force Weather Services Research, Project 643560 in order to properly align Advanced Component Development and Prototype activities with the correct funding source. | | | |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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|---|---|
| Appropriation/Budget Activity 3600: Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P) | R-1 Program Element (Number/Name) PE 0604002F I Air Force Weather Services Research |
|---|---|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| -Continue AFRL Analysis of Alternatives (AoA) started under PE0305111F in FY19 for existing RADEX models and begin technology maturation efforts. -Perform and exploit new data ingest of space weather observations. -Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, prototyping, etc. FY 2019 to FY 2020 Increase/Decrease Statement: FY20 BA4 funding increased due to realigning BA7 funds to BA4 activities | | | |
| Title: Space Weather Analysis and Forecast Energetic Charged Particle Hazard Assessment (SWAFS-ECP HAS) Description: SWAFS-ECP HAS AFRL Analysis of Alternatives (AoA) and Modeling FY 2020 Plans: This is a new start in FY2020. In FY2020, a portion of PE 0305111F, Weather Services, Project 672738 efforts were transferred to PE 0604002F, Air Force Weather Services Research, Project 643560 in order to properly align Advanced Component Development and Prototype activities with the correct funding source. -Continue AFRL Analysis of Alternatives (AoA) started under PE0305111F in FY19 for existing ECP HAS models and begin technology maturation efforts. -Begin Magnetic Field Measuring (Magnetometer) AoA. -Perform and exploit new data ingest of space weather observations. -Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, prototyping, etc. FY 2019 to FY 2020 Increase/Decrease Statement: FY20 BA4 funding increased due to realigning BA7 funds to BA4 activities | - | - | 0.372 |
| Accomplishments/Planned Programs Subtotals | | | |
| | - | - | 0.772 |

| D. Other Program Funding Summary (\$ in Millions) | | | | | | | | | | | |
|--|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|
| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> <u>Base</u> | <u>FY 2020</u> <u>OCO</u> | <u>FY 2020</u> <u>Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To</u> <u>Complete</u> | <u>Total Cost</u> |
| • RDTE 07 0305111F: WEATHER SERVICE | - | 3.621 | 2.357 | - | 2.357 | 2.185 | 3.035 | 3.050 | 3.101 | 0.000 | 17.349 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0604002F / <i>Air Force Weather Services Research</i> |
|--|--|

E. Acquisition Strategy
SWAFS will use individual FAR-based and rapid acquisition contracting methods, as well as AFRL for development works (Technology Readiness Level (TRL) 6 and below) to develop AoA, design solutions, and prototype code.

F. Performance Metrics
Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604002F / Air Force Weather Services Research | Project (Number/Name) 643560 / AF Weather Services Research |

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| SWAFS-RadEx | | | | | | | | | | | | | | | | | | | | | | | | | |
| SWAFS-RadEx Analysis of Alternatives | | | | | | | | | | | | | | | | | | | | | | | | | |
| SWAFS-ECP HAS | | | | | | | | | | | | | | | | | | | | | | | | | |
| SWAFS-ECP HAS Analysis of Alternatives | | | | | | | | | | | | | | | | | | | | | | | | | |
| Magnetic Field Measuring | | | | | | | | | | | | | | | | | | | | | | | | | |
| Magnetometer Analysis of Alternatives | | | | | | | | | | | | | | | | | | | | | | | | | |
| Scintillation Nowcast | | | | | | | | | | | | | | | | | | | | | | | | | |
| Forecast Model Update Analysis of Alternatives | | | | | | | | | | | | | | | | | | | | | | | | | |
| Solar Wind | | | | | | | | | | | | | | | | | | | | | | | | | |
| Solar Wind Model Analysis of Alternatives | | | | | | | | | | | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604002F / <i>Air Force Weather Services Research</i> | Project (Number/Name) 643560 / <i>AF Weather Services Research</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| SWAFS-RadEx | | | | |
| SWAFS-RadEx Analysis of Alternatives | 1 | 2020 | 4 | 2021 |
| SWAFS-ECP HAS | | | | |
| SWAFS-ECP HAS Analysis of Alternatives | 1 | 2020 | 4 | 2021 |
| Magnetic Field Measuring | | | | |
| Magnetometer Analysis of Alternatives | 1 | 2020 | 4 | 2020 |
| Scintillation Nowcast | | | | |
| Forecast Model Update Analysis of Alternatives | 1 | 2021 | 4 | 2021 |
| Solar Wind | | | | |
| Solar Wind Model Analysis of Alternatives | 1 | 2022 | 4 | 2024 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0604004F / <i>Advanced Engine Development</i> |
|--|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|------------------------------------|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 0.000 | 720.355 | 878.442 | 0.000 | 878.442 | 637.657 | 0.000 | 0.000 | 0.000 | 0.000 | 2,236.454 |
| 643608: <i>Advanced Engine Dev</i> | - | 0.000 | 720.355 | 878.442 | 0.000 | 878.442 | 637.657 | 0.000 | 0.000 | 0.000 | 0.000 | 2,236.454 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | - | - |

A. Mission Description and Budget Item Justification

The Advanced Engine Development Program enables demonstration of advanced turbine engine prototypes. This program is maturing fuel efficient adaptive engine component technologies and reducing associated risk in preparation for next-generation propulsion system development for multiple combat aircraft applications. Adaptive engine technology enables next generation combat aircraft capabilities by combining the efficiency of high bypass turbofans used by commercial airlines with the performance demanded of military fighter engines. This technology has undergone initial development under the auspices of the Air Force Research Laboratory through the Adaptive Engine Technology and Adaptive Engine Technology Demonstrator programs.

The Advanced Engine Development program element is new for FY 2019. In FY 2019, the entirety of this program was transferred from PE 0604858F, Tech Transition Program, to PE 0604004F, Advanced Engine Development, Project 643608, Advanced Engine Dev, in order to provide increased transparency to Congress on Air Force prototyping activities as directed in the Defense Appropriations Act 2019. This is an administrative realignment only and is not a new start.

In addition, this program element may include necessary civilian pay expenses required to manage, execute, and deliver advanced engine capabilities. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, 0605898F, and 0605833F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0604004F / <i>Advanced Engine Development</i> |
|--|--|

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Current President's Budget | 0.000 | 720.355 | 878.442 | 0.000 | 878.442 |
| Total Adjustments | 0.000 | 720.355 | 878.442 | 0.000 | 878.442 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | -70.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 790.355 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 878.442 | 0.000 | 878.442 |

Change Summary Explanation

Increase in FY 2019 of \$790.355 million is due to a Congressional directed transfer in the Department of Defense Appropriations Act 2019 to move Advanced Engine Development work (Adaptive Engine Transition Program) from PE 0604858F, Tech Transition, to its own program element (PE 0604004F).

Decrease in FY 2019 of \$70.000 million is due to a Congressional directed reduction in the Department of Defense Appropriations Act 2019 for unjustified growth.

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| Title: Adaptive Engine Transition Program | 0.000 | 720.355 | 878.442 |
| Description: The Adaptive Engine Transition Program (AETP) will design and manufacture multiple flight-weight adaptive engine prototypes, complete component rig assessments, characterize materials, and inform manufacturing process improvements. By producing flight-weight prototypes, the program will demonstrate adaptive engine technology can be scaled to meet military fighter engine size requirements, while ensuring appropriate manufacturing- and technology-readiness levels. By performing sea-level, altitude, and durability assessments across multiple power settings, the prototype engines will demonstrate fuel efficiency increases, thrust increases, and new component technologies. These assessments will provide data to quantify the capability and reduce risk in areas such as thermal capacity, reliability, and supportability, among others. | | | |
| In FY 2018, this work was performed under PE 0604858F, Tech Transition Program, Project 645351, Prototyping, Adaptive Engine Transition Program effort. | | | |
| FY 2019 Plans: | | | |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0604004F / <i>Advanced Engine Development</i> |
|--|--|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|---------|---------|---------|
| Continue detailed design activities. Continue component rig activities. Continue technology, affordability, and sustainability studies. Begin first engine fabrication. Begin additional airframe integration/adaptive propulsion design efforts. More details can be provided in an appropriate forum. | | | |
| <i>FY 2020 Plans:</i> Continue component rig activities. Continue technology, affordability, and sustainability studies. Continue engine fabrication. Begin engine assessments. Continue additional airframe integration/adaptive propulsion design efforts. More details can be provided in an appropriate forum. | | | |
| <i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> FY 2020 increased compared to FY 2019 by \$158.087 million. Funding increased due to continued emphasis on additional capability maturation and risk reduction efforts for multiple adaptive propulsion applications. More details can be provided in an appropriate forum. | | | |
| Accomplishments/Planned Programs Subtotals | 0.000 | 720.355 | 878.442 |

| D. Other Program Funding Summary (\$ in Millions) | | | | | | | | | | | |
|--|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|
| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> <u>Base</u> | <u>FY 2020</u> <u>OCO</u> | <u>FY 2020</u> <u>Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To</u> <u>Complete</u> | <u>Total Cost</u> |
| • RDTE 04 0604858F: <i>Tech Transition Program</i> | 565.450 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 565.450 |

Remarks
In FY 2018, the work for the Advanced Engine Development Program (AETP) was reported in PE 0604858F, Tech Transition Program, Project 645351, Prototyping, under the Adaptive Engine Transition Program effort.

E. Acquisition Strategy
For Adaptive Engine Transition Program, the Air Force has awarded two limited source, cost plus incentive fee contracts to General Electric and Pratt & Whitney due to their unique qualifications to design a high performance, flight-weight adaptive turbine engine in the thrust class for AETP. Incentive categories include engine weight, performance factors, and maintainability and supportability, with specific metrics for each area incentivized. The government agency responsible for managing this program is the Air Force Life Cycle Management Center, Propulsion Directorate, Wright-Patterson Air Force Base, Ohio.

F. Performance Metrics
Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604004F / <i>Advanced Engine Development</i> | Project (Number/Name) 643608 / <i>Advanced Engine Dev</i> |
|--|--|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Adaptive Engine Transition Program - GE | C/CPIF | GE : Evendale, OH | - | 0.000 | | 361.453 | Oct 2018 | 436.017 | Oct 2019 | - | | 436.017 | Continuing | Continuing | - |
| Adaptive Engine Transition Program - PW | C/CPIF | PW : East Hartford, CT | - | 0.000 | | 355.002 | Oct 2018 | 433.502 | Oct 2019 | - | | 433.502 | Continuing | Continuing | - |
| Subtotal | | | - | 0.000 | | 716.455 | | 869.519 | | - | | 869.519 | Continuing | Continuing | N/A |

Remarks
In FY 2018, the work for the Advanced Engine Development Program (AETP) was reported in PE 0604858F, Tech Transition Program, Project 645351, Prototyping, under the Adaptive Engine Transition Program effort.

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Adaptive Engine Transition Program - Program Management Support | Various | Various : TBD | - | 0.000 | | 3.900 | Dec 2018 | 8.923 | Dec 2019 | - | | 8.923 | Continuing | Continuing | - |
| Subtotal | | | - | 0.000 | | 3.900 | | 8.923 | | - | | 8.923 | Continuing | Continuing | N/A |

Remarks
In FY 2018, the work for the Advanced Engine Development Program (AETP) was reported in PE 0604858F, Tech Transition Program, Project 645351, Prototyping, under the Adaptive Engine Transition Program effort.


| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|
| Project Cost Totals | - | 0.000 | 720.355 | 878.442 | - | 878.442 | Continuing | Continuing | N/A |

Remarks

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| | | |
|---|--|---|
| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604004F / <i>Advanced Engine Development</i> | Project (Number/Name) 643608 / <i>Advanced Engine Dev</i> |

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
|---|--|
| <i>Adaptive Engine Transition Program</i> | |
| Detailed Design, Engine Fabrication, Engine Assessments |  |

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| | | |
|--|--|---|
| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604004F / <i>Advanced Engine Development</i> | Project (Number/Name) 643608 / <i>Advanced Engine Dev</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|---|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Adaptive Engine Transition Program</i> | | | | |
| Detailed Design, Engine Fabrication, Engine Assessments | 1 | 2019 | 2 | 2022 |

Note

In FY 2018, the work for the Advanced Engine Development Program (AETP) was reported in PE 0604858F, Tech Transition Program, Project 645351, Prototyping, under the Adaptive Engine Transition Program effort.

The Adaptive Engine Transition Program consists of three phases: detailed design, engine fabrication, and engine assessments.

Program deliverables include: military adaptive engine detailed design parameters and models, multiple engine sets of hardware (plus spare parts), matured technologies, major rig assessment data (controls, combustor, etc.), program reviews, and technology, affordability and sustainability studies.

The scheduled has been extended to accommodate additional airframe integration and adaptive propulsion work that was awarded in FY 2018.

Additional details can be provided in the appropriate forum.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|--|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0604015F / <i>Long Range Strike - Bomber</i> |
|--|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|-------------|-----------|-----------|--------------|-------------|---------------|-----------|-----------|-----------|-----------|------------------|------------|
| Total Program Element | - | 1,914.611 | 2,279.196 | 3,003.899 | 0.000 | 3,003.899 | 3,047.888 | 2,941.785 | 2,661.600 | 2,263.600 | Continuing | Continuing |
| 643308: <i>Long Range Strike Bomber</i> | - | 1,914.611 | 2,279.196 | 3,003.899 | 0.000 | 3,003.899 | 3,047.888 | 2,941.785 | 2,661.600 | 2,263.600 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

This program is reported in accordance with Title 10, United States Code, Section 119(a)(1) in the Special Access Program Annual Report to Congress. For further information, please contact the Director of Special Programs, OUSD(A&S)/DSP.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 2,003.580 | 2,314.196 | 3,008.889 | 0.000 | 3,008.889 |
| Current President's Budget | 1,914.611 | 2,279.196 | 3,003.899 | 0.000 | 3,003.899 |
| Total Adjustments | -88.969 | -35.000 | -4.990 | 0.000 | -4.990 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | -20.000 | -35.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -68.969 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | -4.990 | 0.000 | -4.990 |

Change Summary Explanation

This program is reported in accordance with Title 10, United States Code, Section 119(a)(1) in the Special Access Program Annual Report to Congress. For further information, please contact the Director of Special Programs, OUSD(A&S)/DSP.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|--|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force / BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0604015F / <i>Long Range Strike - Bomber</i> |
|--|---|

C. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|--|-----------|-----------|--------------|-------------|---------------|
| Title: Long Range Strike Bomber Description: Long Range Strike Bomber FY 2019 Plans: This program is reported in accordance with Title 10, United States Code, Section 119(a)(1) in the Special Access Program Annual Report to Congress. For further information, please contact the Director of Special Programs, OUSD(A&S)/DSP. FY 2020 Base Plans: This program is reported in accordance with Title 10, United States Code, Section 119(a)(1) in the Special Access Program Annual Report to Congress. For further information, please contact the Director of Special Programs, OUSD(A&S)/DSP. FY 2020 OCO Plans: This program is reported in accordance with Title 10, United States Code, Section 119(a)(1) in the Special Access Program Annual Report to Congress. For further information, please contact the Director of Special Programs, OUSD(A&S)/DSP. FY 2019 to FY 2020 Increase/Decrease Statement: This program is reported in accordance with Title 10, United States Code, Section 119(a)(1) in the Special Access Program Annual Report to Congress. For further information, please contact the Director of Special Programs, OUSD(A&S)/DSP. | 1,914.611 | 2,279.196 | 3,003.899 | 0.000 | 3,003.899 |
| Accomplishments/Planned Programs Subtotals | 1,914.611 | 2,279.196 | 3,003.899 | 0.000 | 3,003.899 |

D. Other Program Funding Summary (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| • MILCON PE 0604015: <i>Long Range Strike Bomber</i> | - | - | - | - | - | 81.300 | 172.700 | 33.900 | 63.300 | Continuing | Continuing |

Remarks

E. Acquisition Strategy

This program is reported in accordance with Title 10, United States Code, Section 119(a)(1) in the Special Access Program Annual Report to Congress. For further information, please contact the Director of Special Programs, OUSD(A&S)/DSP.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| Appropriation/Budget Activity | R-1 Program Element (Number/Name) |
|--|---|
| 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | PE 0604015F / <i>Long Range Strike - Bomber</i> |

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|---|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604015F / Long Range Strike - Bomber | Project (Number/Name) 643308 / Long Range Strike Bomber |
|--|--|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|--------------------------------|-------------|-----------|------------|-----------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Actual breakout provided in Special Access Program Annual Report to Congress | Various | N/A : NV | - | 1,914.611 | | 2,279.196 | | 3,003.899 | | - | | 3,003.899 | Continuing | Continuing | - |
| Subtotal | | | - | 1,914.611 | | 2,279.196 | | 3,003.899 | | - | | 3,003.899 | Continuing | Continuing | N/A |
| Project Cost Totals | | | - | 1,914.611 | | 2,279.196 | | 3,003.899 | | - | | 3,003.899 | Continuing | Continuing | N/A |

Remarks
 This program is reported in accordance with Title 10, United States Code, Section 119(a)(1) in the Special Access Program Annual Report to Congress. For further information, please contact the Director of Special Programs, OUSD(A&S)/DSP.

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|--|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604015F / <i>Long Range Strike - Bomber</i> | Project (Number/Name) 643308 / <i>Long Range Strike Bomber</i> |
|--|---|--|

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
|--|--|
| <i>Long Range Strike Bomber</i> | |
| Actual schedule provided in Special Access Program Annual Report to Congress | |

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|--|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604015F / <i>Long Range Strike - Bomber</i> | Project (Number/Name) 643308 / <i>Long Range Strike Bomber</i> |
|--|---|--|

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Long Range Strike Bomber</i> | | | | |
| Actual schedule provided in Special Access Program Annual Report to Congress | 1 | 2018 | 4 | 2024 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|--|--|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0604032F / <i>Directed Energy Prototyping</i> |
|--|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|-------------------------------|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 0.000 | 50.000 | 10.000 | 0.000 | 10.000 | 15.000 | 5.000 | 0.000 | 0.000 | 0.000 | 80.000 |
| 640200: <i>DE Prototyping</i> | - | 0.000 | 50.000 | 10.000 | 0.000 | 10.000 | 15.000 | 5.000 | 0.000 | 0.000 | 0.000 | 80.000 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | - | - |

A. Mission Description and Budget Item Justification

The Directed Energy Prototyping Program integrates, demonstrates, evaluates, and prototypes high energy laser, high power microwave and other electromagnetic radiation or particle beam technologies. This Program addresses capability needs in airbase defense, precision strike and aircraft protect capabilities. The Directed Energy Prototyping Program bridges the gap between technology demonstration and successful acquisition and operation or operational capability implementation.

Prototyping enables integration, test, evaluation and demonstration of emerging weapon technologies as a bridge between the laboratory and the warfighter. The Directed Energy Prototyping Program allows acquisition program managers (capability developers) and warfighters (capability recipients and end users) to prototype, integrate, evaluate, and demonstrate candidate weapon technologies and assess them in an operational environment in partnership with Program Executive officers, schoolhouses, simulation facilities, major commands, combatant commands, and developmental planning organizations.

The Directed Energy Prototyping Program Element is new for FY 2019. In FY 2019, the entirety of Directed Energy Prototyping efforts was transferred from PE 0604858F, Technology Transition Program, Project 645351, Prototyping, in order to provide increased transparency to Congress on Air Force Prototyping activities as directed in the Department of Defense Appropriation Act 2019. This is an administrative realignment and not a new start.

In addition, this program element may include necessary civilian pay expenses required to manage, execute, and deliver weapon system capability. It may also include necessary civilian pay expenses required to perform analysis and developmental activities required in support of the transition of weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, 0605898F, and 0605833F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|---|
| Appropriation/Budget Activity 3600: Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P) | R-1 Program Element (Number/Name) PE 0604032F I Directed Energy Prototyping |
|---|---|

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Current President's Budget | 0.000 | 50.000 | 10.000 | 0.000 | 10.000 |
| Total Adjustments | 0.000 | 50.000 | 10.000 | 0.000 | 10.000 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 50.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 10.000 | 0.000 | 10.000 |

Congressional Add Details (\$ in Millions, and Includes General Reductions)

Project: 640200: DE Prototyping

Congressional Add: Program Increase - Directed Energy Prototyping

Congressional Add Subtotals for Project: 640200

Congressional Add Totals for all Projects

| | FY 2018 | FY 2019 |
|--|----------------|----------------|
| | 0.000 | 50.000 |
| | 0.000 | 50.000 |
| | 0.000 | 50.000 |

Change Summary Explanation

Increase in FY 2020 for directed energy counter-unmanned aerial system (c-UAS) prototyping.

C. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| Title: Directed Energy Capabilities | 0.000 | 0.000 | 10.000 |
| Description: Prototypes and evaluates Directed Energy weapon technologies for Airbase Defense against unmanned aerial vehicles and cruise missiles, Precision Strike against electronic and conventional targets and Aircraft defense against incoming threats. | | | |
| In FY 2018, this work was performed under the FY 2018 Directed Energy Prototyping Congressional Add in PE 0604858F, Tech Transition Program, Project 645351, Prototyping. | | | |
| FY 2019 Plans: | | | |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|---|
| Appropriation/Budget Activity 3600: Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P) | R-1 Program Element (Number/Name) PE 0604032F I Directed Energy Prototyping |
|---|---|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|---------|---------|---------|
| In FY 2019, this work is performed under the FY 2019 Directed Energy Prototyping Congressional add within this Project. | | | |
| FY 2020 Plans: Obtain High Power Microwave counter-Unmanned Aerial Vehicle prototypes currently available and evaluate them for mission effectiveness and fielding, logistics, and deployment requirements. These assets may be made available for experimentation and test by the Directed Energy Experimentation Campaign, the Joint Directed Energy Test Center, White Sands Missile Range or other Air Force agency or Command. May conduct additional Directed Energy Prototyping work as directed by Air Force senior leadership. | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 increased compared to FY 2019 by \$10.000 million. Funding increased due to additional emphasis on the counter unmanned aerial system high power microwave solutions. | | | |
| Accomplishments/Planned Programs Subtotals | 0.000 | 0.000 | 10.000 |

| | FY 2018 | FY 2019 |
|--|---------|---------|
| Congressional Add: Program Increase - Directed Energy Prototyping | 0.000 | 50.000 |
| FY 2018 Accomplishments: FY 2018 Congressional Add is reported under PE 0604858F, Tech Transition Program, Project 645351, Prototyping. | | |
| FY 2019 Plans: Conduct Congressionally directed efforts. | | |
| Congressional Adds Subtotals | 0.000 | 50.000 |

D. Other Program Funding Summary (\$ in Millions)

| Line Item | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|---------|---------|-----------------|----------------|------------------|---------|---------|---------|---------|---------------------|------------|
| • RDTE 04 0604858F: <i>Tech Transition Program</i> | 67.464 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 67.464 |

Remarks
In FY 2018, Directed Energy Prototyping is reported under PE 0604858F, Tech Transition Program, Project 645351, Prototyping, as a Congressional Add.

E. Acquisition Strategy
For Directed Energy Prototyping, the Air Force will conduct market research and plan to award contracts for commercially available, non-developmental Directed Energy Systems for counter-Unmanned Aerial Vehicles. The government agency responsible for managing this program is the Air Force Life Cycle Management Center, Program Development & Integration Directorate, Wright-Patterson Air Force Base, Ohio.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| Appropriation/Budget Activity | R-1 Program Element (Number/Name) |
|--|--|
| 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | PE 0604032F / <i>Directed Energy Prototyping</i> |

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|--|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604032F / <i>Directed Energy Prototyping</i> | Project (Number/Name) 640200 / <i>DE Prototyping</i> |
|--|--|--|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Directed Energy Airbase Defense Prototypes | Various | TBD : TBD | - | 0.000 | | 45.000 | | - | | - | | - | Continuing | Continuing | - |
| Directed Energy Airbase Defense Prototyping and Operational Testing | C/TBD | TBD : TBD | - | - | | - | | 8.000 | | - | | 8.000 | Continuing | Continuing | - |
| Subtotal | | | - | 0.000 | | 45.000 | | 8.000 | | - | | 8.000 | Continuing | Continuing | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Directed Energy Prototyping Program Administration | Various | Not specified. : TBD | - | - | | 5.000 | | 2.000 | | - | | 2.000 | Continuing | Continuing | - |
| Subtotal | | | - | - | | 5.000 | | 2.000 | | - | | 2.000 | Continuing | Continuing | N/A |

| | | | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|--|--|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|
| Project Cost Totals | | | - | 0.000 | 50.000 | 10.000 | - | 10.000 | Continuing | Continuing | N/A |

Remarks
 In FY 2018, Directed Energy Prototyping is reported under PE 0604858F, Tech Transition Program, Project 645351, Prototyping

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|--|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604032F / <i>Directed Energy Prototyping</i> | Project (Number/Name) 640200 / <i>DE Prototyping</i> |
|--|--|--|

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|--|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
|-----------------------------------|--|
| Operational Prototypes | |
| System Acquisition | ██████████ |
| Competitive Downselect and test | ████████████████████ |
| Build and operational test | |
| Initial build and test | ██ |

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|--|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604032F / <i>Directed Energy Prototyping</i> | Project (Number/Name) 640200 / <i>DE Prototyping</i> |
|--|--|--|

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Operational Prototypes</i> | | | | |
| System Acquisition | 1 | 2019 | 3 | 2019 |
| Competitive Downselect and test | 4 | 2019 | 3 | 2020 |
| <i>Build and operational test</i> | | | | |
| Initial build and test | 3 | 2020 | 4 | 2022 |

Note

In FY 2018, Directed Energy Prototyping work is reported under PE 0604858F, Tech Transition Program, Project 645351

Related Directed Energy Weapons Experimentation Campaign Activities for the Operational Prototypes are reported under PE 0604858F, Tech Transition Program, Project 645350, Experimentation from 1st Quarter FY 2020 through 4th quarter FY 2020.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| Appropriation/Budget Activity | | | | | R-1 Program Element (Number/Name) | | | | | | | |
|--|--------------------|----------------|----------------|---------------------|--|----------------------|----------------|----------------|----------------|----------------|-------------------------|-------------------|
| 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | | | | | PE 0604033F / <i>Hypersonics Prototyping</i> | | | | | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| Total Program Element | - | 0.000 | 508.858 | 576.000 | 0.000 | 576.000 | 201.200 | 28.500 | 0.000 | 0.000 | Continuing | Continuing |
| 643882: <i>Air-Launched Rapid Response Weapon (ARRW)</i> | - | 0.000 | 219.230 | 286.000 | 0.000 | 286.000 | 201.200 | 28.500 | 0.000 | 0.000 | 0.000 | 734.930 |
| 643885: <i>Hypersonic Conventional Strike Weapon (HCSW)</i> | - | 0.000 | 289.628 | 290.000 | 0.000 | 290.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

The Hypersonic Prototyping program enables integration and demonstration of emerging hypersonic technologies in an operational or operational-like environment to capitalize on successful laboratory hypersonic research and development efforts with high warfighter priority. Integration and demonstration of hypersonic prototypes also allows leadership to make informed strategy and resource decisions based for future programs on the results of such hypersonic prototype demonstrations.

Hypersonic Prototyping enables a key linkage between research and development in the lab and fielding advanced technologies to the warfighter. Under this program, Air-Launched Rapid response Weapon (ARRW) and Hypersonic Conventional Strike Weapon (HCSW) will accelerate the technology transfer of hypersonic technologies to enable a responsive, long range strike capability.

The Hypersonics Prototyping Program Element is new for FY 2019. In FY 2019, the entirety of Hypersonics prototyping efforts were transferred from PE 0604858F, Tech Transition Program, in order to provide increased transparency to Congress on Air Force prototyping activities as directed in the Department of Defense Appropriation Act 2019. This is an administrative realignment only and is not a new start.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver Hypersonics prototyping capabilities. The use of such program funds would be in addition to civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, 0605898F, and 0605833F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|---|
| Appropriation/Budget Activity 3600: Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P) | R-1 Program Element (Number/Name) PE 0604033F I Hypersonics Prototyping |
|---|---|

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Current President's Budget | 0.000 | 508.858 | 576.000 | 0.000 | 576.000 |
| Total Adjustments | 0.000 | 508.858 | 576.000 | 0.000 | 576.000 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 250.800 | | | |
| • Congressional Directed Transfers | 0.000 | 258.058 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 576.000 | 0.000 | 576.000 |

Congressional Add Details (\$ in Millions, and Includes General Reductions)

Project: 643882: Air-Launched Rapid Response Weapon (ARRW)

Congressional Add: Program increase - air-launched rapid response weapon

Congressional Add Subtotals for Project: 643882

| | FY 2018 | FY 2019 |
|---|----------------|----------------|
| | 0.000 | 50.500 |
| Congressional Add Subtotals for Project: 643882 | 0.000 | 50.500 |
| | 0.000 | 200.300 |
| Congressional Add Subtotals for Project: 643885 | 0.000 | 200.300 |
| Congressional Add Totals for all Projects | 0.000 | 250.800 |

Project: 643885: Hypersonic Conventional Strike Weapon (HCSW)

Congressional Add: Program Increase - Hypersonic Conventional Strike Weapon

Congressional Add Subtotals for Project: 643885

Congressional Add Totals for all Projects

Change Summary Explanation

Increase in FY 2019 due to a Congressionally-directed transfer in the Department of Defense Appropriations Act 2019 to move hypersonics prototyping efforts from PE 0604858F, Tech Transition Program, to its own program element (PE 0604033F).

Increase in FY 2020 is due to hypersonics prototyping efforts being transferred from PE 0604858F, Tech Transition Program, and additional funding for both the Air-Launched Rapid Response Weapon and Hypersonic Conventional Strike Weapon efforts.

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|---|--------------------|----------------|----------------|---------------------|--|----------------------|----------------|----------------|---|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 4 | | | | | R-1 Program Element (Number/Name) PE 0604033F / <i>Hypersonics Prototyping</i> | | | | Project (Number/Name) 643882 / <i>Air-Launched Rapid Response Weapon (ARRW)</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 643882: <i>Air-Launched Rapid Response Weapon (ARRW)</i> | - | 0.000 | 219.230 | 286.000 | 0.000 | 286.000 | 201.200 | 28.500 | 0.000 | 0.000 | 0.000 | 734.930 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

The Air-Launched Rapid Response Weapon (ARRW) project integrates Air Force and DARPA enabled system technologies into a prototype that will demonstrate the viability of this concept to be fielded as a long range prompt strike capability. ARRW will design, develop, manufacture, and test, a number of prototype vehicles to inform decisions concerning ARRW acquisition and production.

In FY 2019, ARRW efforts were transferred from PE 0604858F, Tech Transition Program to PE 0604033, Hypersonics Prototyping , Project 643882, Air-Launched Rapid Response Weapon (ARRW), in order to provide increased transparency to Congress on Air Force prototyping activities as directed in the Department of Defense Appropriations Act 2019. This was an administrative realignment and not a new start.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| Title: Air Launched Rapid Response Weapon (ARRW) | 0.000 | 168.730 | 286.000 |
| Description: Integrates Air Force and DARPA enabled system technologies into a prototype that will demonstrate the viability of this concept to be fielded as a long range prompt strike capability. ARRW will design, develop, manufacture, and test, a number of prototype vehicles to inform decisions concerning ARRW acquisition and production. | | | |
| In FY 2018, this work was performed under the Lifecycle Prototyping effort in PE 0604858F, Tech Transition Program, Project 645351, Prototyping. | | | |
| FY 2019 Plans: Continue with ARRW design activities and complete the system delta preliminary design review. Construct and test instrumented measurement vehicles. | | | |
| FY 2020 Plans: Continue with ARRW design activities and complete the system critical design review. Construct and test the booster test vehicles. | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 increased compared to FY 2019 by \$117.270 million. Funding increased to support ARRW system critical design review, construction, and testing of booster test vehicles. | | | |
| Accomplishments/Planned Programs Subtotals | 0.000 | 168.730 | 286.000 |

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|---|--|---|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604033F / <i>Hypersonics Prototyping</i> | Project (Number/Name) 643882 / <i>Air-Launched Rapid Response Weapon (ARRW)</i> |

| | | |
|---|----------------|----------------|
| | FY 2018 | FY 2019 |
| Congressional Add: Program increase - air-launched rapid response weapon | 0.000 | 50.500 |
| FY 2018 Accomplishments: Not Applicable | | |
| FY 2019 Plans: Conduct Congressionally directed efforts | | |
| Congressional Adds Subtotals | 0.000 | 50.500 |

C. Other Program Funding Summary (\$ in Millions)

| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> <u>Base</u> | <u>FY 2020</u> <u>OCO</u> | <u>FY 2020</u> <u>Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To</u> <u>Complete</u> | <u>Total Cost</u> |
|---|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|
| • RDTE 04 0604858F: <i>Tech Transition Program</i> | 82.581 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 82.581 |

Remarks

In FY 2018, the work for ARRW was performed under the Lifecycle Prototyping effort in PE 0604858F, Tech Transition Program, Project 645351, Prototyping.

D. Acquisition Strategy

Acquisition Decision Memorandum (signed 3 May 2018) designated Air-Launched Rapid Response Weapon (ARRW) as Section 804 Rapid Prototyping Program.

The Air Force awarded in August 2018 an undefinitized contract in order to complete a critical design review and procure all long lead parts and materials. Upon definitization, the ARRW program will modify the contract to award the entire RDT&E effort (through the end of flight test). The cost type contract includes schedule incentives to earn a higher fixed fee. The government agency responsible for managing this program is the Air Force Life Cycle Management Center, Armament Directorate, Eglin AFB, FL.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|---|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604033F / <i>Hypersonics Prototyping</i> | Project (Number/Name) 643882 / <i>Air-Launched Rapid Response Weapon (ARRW)</i> |
|--|--|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| ARRW - Contract | C/FFP | LMCO: Various: TBD : TBD | - | 0.000 | | 185.000 | Feb 2019 | 259.200 | Mar 2020 | - | | 259.200 | Continuing | Continuing | - |
| ARRW - Mission Planning | C/CPFF | Various: TBD : TBD | - | 0.000 | | 1.900 | Mar 2019 | 1.900 | Mar 2020 | - | | 1.900 | Continuing | Continuing | - |
| Subtotal | | | - | 0.000 | | 186.900 | | 261.100 | | - | | 261.100 | Continuing | Continuing | N/A |

Remarks
 In FY 2018, ARRW data is reported under PE 0604858F, Tech Transition Program, Project 645351, Prototyping.
 ARRW - This effort is part of the DARPA Other Transaction Authority (OTA) and Air Force contracts.

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| ARRW - Government Test | Various | Various: TBD : TBD | - | 0.000 | | 28.830 | May 2019 | 21.000 | May 2020 | - | | 21.000 | Continuing | Continuing | - |
| Subtotal | | | - | 0.000 | | 28.830 | | 21.000 | | - | | 21.000 | Continuing | Continuing | N/A |

Remarks
 In FY 2018, ARRW data is reported under PE 0604858F, Tech Transition Program, Project 645351, Prototyping.

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| ARRW - Program Management Administration | Various | Multiple: TBD : TBD | - | 0.000 | | 3.500 | Sep 2019 | 3.900 | Sep 2020 | - | | 3.900 | Continuing | Continuing | - |
| Subtotal | | | - | 0.000 | | 3.500 | | 3.900 | | - | | 3.900 | Continuing | Continuing | N/A |

Remarks
 In FY 2018, ARRW data is reported under PE 0604858F, Tech Transition Program, Project 645351, Prototyping.
 Includes A&AS support requirements plus TDY, and office supplies. FY 2019 reflects full staffing.

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|--|--------------------|----------------|--|---------------------|--------------------|---|----------------------------|-------------------|---------------------------------|--|--|
| Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force | | | | | | | Date: February 2019 | | | | |
| Appropriation/Budget Activity 3600 / 4 | | | R-1 Program Element (Number/Name) PE 0604033F / <i>Hypersonics Prototyping</i> | | | Project (Number/Name) 643882 / <i>Air-Launched Rapid Response Weapon (ARRW)</i> | | | | | |
| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract | | |
| Project Cost Totals | - | 0.000 | 219.230 | 286.000 | - | 286.000 | Continuing | Continuing | N/A | | |

Remarks
Additional details on Hypersonics prototyping concepts can be provided in the appropriate forum.

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604033F / <i>Hypersonics Prototyping</i> | Project (Number/Name) 643882 / <i>Air-Launched Rapid Response Weapon (ARRW)</i> |

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
|---|------------|
| <i>Air Launched Rapid Response Weapon (ARRW)</i> | |
| ARRW- Contract | [REDACTED] |
| Design and Preliminary Design Review | [REDACTED] |
| Design and Critical Design Review | [REDACTED] |
| Flight Tests | [REDACTED] |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604033F / <i>Hypersonics Prototyping</i> | Project (Number/Name) 643882 / <i>Air-Launched Rapid Response Weapon (ARRW)</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|---|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Air Launched Rapid Response Weapon (ARRW)</i> | | | | |
| ARRW- Contract | 1 | 2019 | 4 | 2022 |
| Design and Preliminary Design Review | 1 | 2019 | 2 | 2020 |
| Design and Critical Design Review | 2 | 2020 | 4 | 2020 |
| Flight Tests | 3 | 2019 | 4 | 2022 |

Note

In FY 2018, the schedules are reported under PE 0604858F, Tech Transition Program, Project 645351, Prototyping.

Further schedule details can be provided in the appropriate forum.

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|---|--------------------|----------------|----------------|---------------------|--|----------------------|----------------|----------------|--|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 4 | | | | | R-1 Program Element (Number/Name) PE 0604033F / <i>Hypersonics Prototyping</i> | | | | Project (Number/Name) 643885 / <i>Hypersonic Conventional Strike Weapon (HCSW)</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 643885: <i>Hypersonic Conventional Strike Weapon (HCSW)</i> | - | 0.000 | 289.628 | 290.000 | 0.000 | 290.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

The Hypersonic Conventional Strike Weapon (HCSW) Project integrates Air Force, Strategic Capabilities Office, and Conventional Prompt Strike (CPS) glide body into a prototype that will demonstrate the viability of this concept to be fielded as a long range prompt strike capability. HCSW will design, develop, manufacture, and test, a number of prototype vehicles to inform decisions concerning future HCSW acquisition and production.

In FY 2019, HCSW efforts were transferred from PE 0604858F, Tech Transition Program, to PE 0604033, Hypersonics Prototyping, Project 643885, Hypersonic Conventional Strike Weapon (HCSW), in order to provide increased transparency to Congress on Air Force prototyping activities as directed in the Department of Defense Appropriations Act 2019. This was an administrative transfer and not a new start.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| Title: Hypersonic Conventional Strike Weapon (HCSW) | 0.000 | 89.328 | 290.000 |
| Description: Integrates Air Force enabled system technologies into a prototype that will demonstrate the viability of this concept to be fielded as a long range prompt strike capability. Hypersonic Conventional Strike Weapon (HCSW) will design, develop, manufacture, and test, a number of prototype vehicles to inform decisions concerning HCSW acquisition and production. | | | |
| In FY 2018 this work was performed under the Lifecycle Prototyping effort in PE 0604858F, Tech Transition Program 645351, Project Prototyping. | | | |
| FY 2019 Plans: Continue program office support, analysis, technical risk reduction, development and integration for the Hypersonic Conventional Strike Weapon and complete Preliminary Design Review (PDR). Begin Critical Design Review. | | | |
| FY 2020 Plans: Continue integration and design activities for the Hypersonic Conventional Strike Weapon. Identify key performance parameters, and complete Critical Design Review. Increase program office footprint and seating via re-locatable, temporary equipment | | | |

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|--|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604033F / <i>Hypersonics Prototyping</i> | Project (Number/Name) 643885 / <i>Hypersonic Conventional Strike Weapon (HCSW)</i> |
|--|--|--|

| | | | |
|--|----------------|----------------|----------------|
| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
| to support workforce and management of programs and security infrastructure upgrades to ensure program schedules are maintained. | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 increased compared to FY 2019 by \$200.672 million. Funding increased to support HCSW integration and critical design review activities. | | | |
| Accomplishments/Planned Programs Subtotals | 0.000 | 89.328 | 290.000 |

| | | |
|--|----------------|----------------|
| | FY 2018 | FY 2019 |
| Congressional Add: Program Increase - Hypersonic Conventional Strike Weapon | 0.000 | 200.300 |
| FY 2018 Accomplishments: Not applicable | | |
| FY 2019 Plans: Conduct Congressionally directed effort. | | |
| Congressional Adds Subtotals | 0.000 | 200.300 |

C. Other Program Funding Summary (\$ in Millions)

| Line Item | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|---------|---------|-----------------|----------------|------------------|---------|---------|---------|---------|---------------------|------------|
| • RDTE 04 0604858F: <i>Tech Transition Program</i> | 49.182 | 0.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 49.182 |

Remarks
In FY 2018 Hypersonics Conventional Strike Weapon was funded under the Lifecycle Prototyping effort in PE 0604858F, Tech Transition Program, Project 645351, Prototyping.

D. Acquisition Strategy
Acquisition Decision Memorandum (signed 3 May 2018) designated Hypersonic Conventional Strike Weapon (HCSW) as Section 804 Rapid Prototyping Program.

The Air Force awarded in April 2018 an Indefinite Delivery / Indefinite Quantity to Lockheed Martin Corp. - Space for the design, development, engineering, systems integration, test, logistics, planning, and aircraft integration support of all the elements of a hypersonic, conventional, air-launched, stand-off weapon. The government agency responsible for managing this program is the Air Force Life Cycle Management Center, Armament Directorate, Eglin AFB, FL.

E. Performance Metrics
Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|--|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604033F / <i>Hypersonics Prototyping</i> | Project (Number/Name) 643885 / <i>Hypersonic Conventional Strike Weapon (HCSW)</i> |
|--|--|--|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|----------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Hypersonic program office support, analysis, technical risk reduction, | C/CPFF | Lockheed Martin : Huntsville, AL | - | 0.000 | | 194.101 | Jan 2019 | 190.279 | Jan 2020 | 0.000 | | 190.279 | Continuing | Continuing | - |
| Hypersonic product development | C/CPAF | Lockheed Martin : Huntsville, AL | - | 0.000 | | - | | - | | - | | - | Continuing | Continuing | - |
| Subtotal | | | - | 0.000 | | 194.101 | | 190.279 | | 0.000 | | 190.279 | Continuing | Continuing | N/A |

Remarks
In FY 2018 Hypersonic Conventional Strike Weapon (HCSW) data is reported under PE 0604858F, Tech Transition Program, Project 645351, Prototyping.

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---------------------------------|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Development & Prototyping | C/CPFF | Multiple: TBD : Various | - | 0.000 | | 57.057 | Apr 2019 | 0.784 | Mar 2020 | 0.000 | | 0.784 | Continuing | Continuing | - |
| Subtotal | | | - | 0.000 | | 57.057 | | 0.784 | | 0.000 | | 0.784 | Continuing | Continuing | N/A |

Remarks
In FY 2018 Hypersonic Conventional Strike Weapon (HCSW) data is reported under PE 0604858F, Tech Transition Program, Project 645351, Prototyping.

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Test and Evaluation | C/CPAF | Multiple: TBD : Various | - | 0.000 | | 33.070 | Jan 2019 | 95.804 | Jan 2020 | 0.000 | | 95.804 | Continuing | Continuing | - |
| Subtotal | | | - | 0.000 | | 33.070 | | 95.804 | | 0.000 | | 95.804 | Continuing | Continuing | N/A |

Remarks
In FY 2018 Hypersonic Conventional Strike Weapon (HCSW) data is reported under PE 0604858F, Tech Transition Program, Project 645351, Prototyping.

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|--|--|--|--|--|--|--|--|--|--|--|----------------------------|--|--|--|--|
| Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force | | | | | | | | | | | Date: February 2019 | | | | |
| Appropriation/Budget Activity 3600 / 4 | | | | | R-1 Program Element (Number/Name) PE 0604033F / <i>Hypersonics Prototyping</i> | | | | | Project (Number/Name) 643885 / <i>Hypersonic Conventional Strike Weapon (HCSW)</i> | | | | | |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | | | |
|---|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | Target Value of Contract |
| Management Services | C/TBD | Multiple: TBD : Various | - | 0.000 | | 5.400 | Sep 2019 | 3.133 | Sep 2020 | 0.000 | | 3.133 | Continuing | Continuing | - |
| Subtotal | | | - | 0.000 | | 5.400 | | 3.133 | | 0.000 | | 3.133 | Continuing | Continuing | N/A |

Remarks
 In FY 2018 Hypersonic Conventional Strike Weapon (HCSW) data is reported under PE 0604858F, Tech Transition Program, Project 645351, Prototyping.
 Includes A&AS support requirements plus TDY and office supplies.

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|--------------------|----------------|----------------|---------------------|--------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Project Cost Totals | - | 0.000 | 289.628 | 290.000 | 0.000 | 290.000 | Continuing | Continuing | N/A |

Remarks

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604033F / <i>Hypersonics Prototyping</i> | Project (Number/Name) 643885 / <i>Hypersonic Conventional Strike Weapon (HCSW)</i> |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|--|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
|--|----------------------|
| <i>Hypersonic Conventional Strike Weapon (HCSW)</i> | |
| Preliminary Design Review | ██████████ |
| Critical Design Review | ████████████████████ |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604033F / <i>Hypersonics Prototyping</i> | Project (Number/Name) 643885 / <i>Hypersonic Conventional Strike Weapon (HCSW)</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Hypersonic Conventional Strike Weapon (HCSW)</i> | | | | |
| Preliminary Design Review | 1 | 2019 | 3 | 2019 |
| Critical Design Review | 3 | 2019 | 4 | 2020 |

Note
 In FY 2018, the HCSW schedules are reported under PE 0604858F, Tech Transition Program, Project 645351, Prototyping.
 Further schedule details can be provided in the appropriate forum.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0604201F / <i>PNT Resiliency, Mods, and Improvements</i> |
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| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 63.302 | 81.271 | 92.600 | 0.000 | 92.600 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 237.173 |
| 641029: <i>GPS Receiver Development</i> | - | 5.014 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 5.014 |
| 641030: <i>GPS Receiver Development</i> | - | 58.288 | 81.271 | 92.600 | 0.000 | 92.600 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 232.159 |

Note

In FY 2020, PE 0207325F, Joint Air-to-Surface Standoff Missile (JASSM), Project 675356 M-Code weapons receiver development efforts and associated funding (FY 2020 \$20.2M) were transferred to PE 604201F, PNT Resiliency, Mods, and Improvements (formerly Integrated Avionics Planning and Development), Project 641030 M-Code weapons receiver development in order to realign M-Code weapons receiver development funding for increased transparency to stakeholders and for unity of effort.

In FY 2019, Project 641029 Universal Navigation Interface (UNI) was terminated, and the technical approach was realigned under EGI-M.

PE 604201F Line Item title, PNT Resiliency, Mods, and Improvements changed from Integrated Avionics Planning and Development.

A. Mission Description and Budget Item Justification

PE 0604201, Project 641029 conducted navigation-aircraft interface standard development that included the Universal Navigation Interface (UNI). The Universal Navigation Interface project developed, enhanced, and implemented standardized interfaces in current/future aircraft and mission planning to support integration of EGI receivers independent of Operational Flight Program (OFP) cycles. Standardization of navigation-aircraft interface enables a more affordable approach and faster upgrade capabilities to an ever changing threat to navigation accuracy.

PE 0604201F, Project 641030 covers the development, integration and testing of Enhanced Anti-Jam (EAJ) Military Code (M-Code) GPS receivers for AF and joint weapon systems. This includes updates to weapon mission planning software to support new M-Code and EAJ receiver development. These acquisitions will enable the Air Force to increase its operational PNT resiliency while satisfying the DoD and civil mandates. Fielding of EAJ M-Code weapons requires the development, integration and testing of M-Code receivers across the AFPEO Weapons Portfolio.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver M-Code Development capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, 0605898F, and 0605833F.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0604201F / <i>PNT Resiliency, Mods, and Improvements</i> |
|--|---|

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 65.458 | 14.894 | 0.000 | 0.000 | 0.000 |
| Current President's Budget | 63.302 | 81.271 | 92.600 | 0.000 | 92.600 |
| Total Adjustments | -2.156 | 66.377 | 92.600 | 0.000 | 92.600 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 66.377 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -2.156 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 92.600 | 0.000 | 92.600 |

Change Summary Explanation

In FY 2018, reduction of \$2.156M for SBIR

In FY 2019, \$66.377M was a requested AF Transfer

In FY 2020, PE 0207325F, Joint Air-to-Surface Standoff Missile (JASSM), Project 675356 M-Code weapons receiver development efforts and associated funding (FY 2020 \$20.2M) were transferred to PE 604201F, PNT Resiliency, Mods, and Improvements (formerly Integrated Avionics Planning and Development), Project 641030 M-Code weapons receiver development in order to realign M-Code weapons receiver development funding for increased transparency to stakeholders and for unity of effort.

In FY 2020 \$72.4M was added to M-Code weapons receiver development to support continued development efforts.

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|---|--------------------|----------------|----------------|---------------------|--|----------------------|----------------|----------------|---|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 4 | | | | | R-1 Program Element (Number/Name) PE 0604201F / PNT Resiliency, Mods, and Improvements | | | | Project (Number/Name) 641029 / GPS Receiver Development | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 641029: GPS Receiver Development | - | 5.014 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 5.014 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

Note

In FY 2018, efforts initiated under PE 0305164F, NAVSTAR Global Positioning System (User Equipment) (Space), Project 643833, Military Global Positioning System User Equipment were transferred to PE 0604201F, Integrated Avionics Planning & Development, Project 651029, Aircraft-Store Development for transparency and to realign resources with the execution responsibilities supporting aircraft weapon system platforms.

PE 604201F Line Item title, PNT Resiliency, Mods, and Improvements changed from Integrated Avionics Planning and Development.

A. Mission Description and Budget Item Justification

In FY2019, Project 641029 Universal Navigation Interface (UNI) was terminated, and the technical approach was realigned under EGI-M.

PE 0604201, Project 641029 conducts navigation-aircraft interface standard development to include the Universal Navigation Interface (UNI). The Universal Navigation Interface project develops, enhances, and implements standardized interfaces in current/future aircraft and mission planning to support integration of EGI receivers independent of Operational Flight Program (OFP) cycles. Standardization of navigation-aircraft interface enables a more affordable approach and faster upgrade capabilities to an ever changing threat to navigation accuracy.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| Title: UNI | 5.014 | 0.000 | 0.000 |
| Description: Conducts navigation-to-aircraft interface standard development to include the Universal Navigation Interface (UNI). Develops standardized software interfaces in aircraft and mission planning to support integration of EGI receiver boxes capable of receiving Modernized GPS signals (M-code). | | | |
| FY 2019 Plans: No FY19 Requirement. | | | |
| FY 2020 Plans: No FY20 Requirement. | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: | | | |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604201F / <i>PNT Resiliency, Mods, and Improvements</i> | Project (Number/Name) 641029 / <i>GPS Receiver Development</i> |

| | | | |
|---|----------------|----------------|----------------|
| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
| N/A | | | |
| Accomplishments/Planned Programs Subtotals | 5.014 | 0.000 | 0.000 |

C. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

In FY 2018, PE 0305164F, NAVSTAR Global Positioning System (User Equipment) (Space), Project 643833, Military Global Positioning System User Equipment partial efforts were transferred to PE 0604201F, Integrated Avionics Planning & Development, Project 641029, STORES - Aircraft Interface for transparency and to realign resources with execution responsibilities that support various aircraft weapon system platforms.

D. Acquisition Strategy

In FY 2019, Project 641029 Universal Navigation Interface (UNI) was terminated, and the technical approach was realigned under EGI-M.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604201F / PNT Resiliency, Mods, and Improvements | Project (Number/Name) 641029 / GPS Receiver Development |
|--|--|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| UNI Software Interface Development | TBD | Not specified. : TBD | - | 5.014 | | - | | - | | - | | - | 0.000 | 5.014 | - |
| Subtotal | | | - | 5.014 | | - | | - | | - | | - | 0.000 | 5.014 | N/A |
| Project Cost Totals | | | - | 5.014 | | 0.000 | | - | | - | | - | 0.000 | 5.014 | N/A |

Remarks
 In FY 2019, Project 641029 Universal Navigation Interface (UNI) was terminated, and the technical approach was realigned under EGI-M. The funding was reprogrammed from this PE for other priorities under ATR FY 2019-01 in Oct 2018.

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604201F / <i>PNT Resiliency, Mods, and Improvements</i> | Project (Number/Name) 641029 / <i>GPS Receiver Development</i> |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|--|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| <i>Universal Navigation Interface (UNI)</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| UNI | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604201F / <i>PNT Resiliency, Mods, and Improvements</i> | Project (Number/Name) 641029 / <i>GPS Receiver Development</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Universal Navigation Interface (UNI)</i> | | | | |
| UNI | 3 | 2018 | 2 | 2019 |

Note

In FY 2019, Project 641029 Universal Navigation Interface (UNI) was terminated, and the technical approach was realigned under EGI-M. The funding was reprogrammed from this PE for other priorities under ATR FY 2019-01 in Oct 2018.

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 4 | | | | | R-1 Program Element (Number/Name) PE 0604201F / PNT Resiliency, Mods, and Improvements | | | | Project (Number/Name) 641030 / GPS Receiver Development | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 641030: GPS Receiver Development | - | 58.288 | 81.271 | 92.600 | 0.000 | 92.600 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 232.159 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

Note

PE 604201F Line Item title, PNT Resiliency, Mods, and Improvements changed from Integrated Avionics Planning and Development.

In FY2020, PE 0207325F, Joint Air-to-Surface Standoff Missile (JASSM), Project 675356 M-Code weapons receiver development efforts and associated funding (FY2020 \$20.2M) were transferred to PE 604201F, PNT Resiliency, Mods, and Improvements (formerly Integrated Avionics Planning and Development), Project 641030 M-Code weapons receiver development in order to realign M-Code weapons receiver development funding for increased transparency to stakeholders and for unity of effort.

In FY2018, M-Code efforts initiated under PE 0207325F (Joint Air-Surface Standoff Missile-Extended Range), PE 0604329F (Small Diameter Bomb II), PE 0604270F (Advanced IR Counter Measures), 0604327F (Hard and Deeply Buried Targets System) and PE 0604618F (Joint Direct Attack Munition) were transferred to PE 0604201F, Integrated Avionics Planning & Development, Project 641030, Munitions Receiver Development for transparency to stakeholders and to realign resources with the organization executing the efforts.

A. Mission Description and Budget Item Justification

This munitions receiver development project includes development of a GPS military code (M-code) receiver with enhanced anti-jam (EAJ) and analysis efforts. M-code receivers with EAJ provide advanced positioning, navigation, and timing (PNT) capabilities required for weapons to operate in adversarial anti-access/area denial (A2/AD) environments. M-Code receivers with EAJ also provide increased accuracy, better signal acquisition, and advanced security.

M-code receivers with EAJ capability assures continued weapon system precision and lethality.

Fielding EAJ M-Code weapons requires the development, integration, testing and mission planning of M-Code receivers across the Weapons Portfolio. This will include all systems, subsystems, software, fuzing, and support activities associated with the development and implementation of M-Code receivers.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| Title: M-Code EAJ | 58.288 | 81.271 | 92.600 |
| Description: M-Code/EAJ receivers provide an enhanced anti-jam capability. M-Code/EAJ receivers provide the capability to operate in increasing adversarial A2/AD jamming environment. M-Code/EAJ receivers also provide increased accuracy, better signal acquisition, and advanced security. | | | |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604201F / PNT Resiliency, Mods, and Improvements | Project (Number/Name) 641030 / GPS Receiver Development |

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| FY 2019 Plans: Develop M-code/EAJ receivers across the AFPEO Weapons portfolio. | | | |
| FY 2020 Plans: Continue development and integration of M-Code/EAJ receivers across the AFPEO Weapons portfolio. | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: The funding increase is in conjunction with planned receiver development activities for all weapon systems. | | | |
| Accomplishments/Planned Programs Subtotals | 58.288 | 81.271 | 92.600 |

| C. Other Program Funding Summary (\$ in Millions) | | | | | | | | | | | |
|--|----------------|----------------|-------------------------|------------------------|--------------------------|----------------|----------------|----------------|----------------|-----------------------------|-------------------|
| Line Item | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| • RDTE 07 0207325F: <i>Joint Air-to-Surface Standoff Missile (JASSM)</i> | 1.645 | 17.594 | 1.400 | - | 1.400 | 14.000 | 12.000 | - | - | 0.000 | 46.639 |
| • RDTE 05 PE 0604329F, BPAC 655191: <i>SDB Increment II</i> | 16.800 | 41.243 | 12.100 | - | 12.100 | 11.000 | 21.000 | - | - | 0.000 | 102.143 |
| • RDTE 05 PE 0604270F, BPAC 655305: <i>Adv Infrared Counter Measures</i> | - | - | - | - | - | - | - | - | - | 0.000 | 0.000 |
| • RDTE 04 PE 0604327F, BPAC 645341: <i>Direct Strike Penetrators</i> | - | 32.962 | 2.200 | - | 2.200 | - | - | - | - | 0.000 | 35.162 |
| • RDTE 05 PE 0604618F, BPAC 653891: <i>JDAM Development</i> | - | - | - | - | - | 7.941 | - | - | - | 0.000 | 7.941 |

Remarks

D. Acquisition Strategy
M-Code/EAJ effort uses a Family of Systems approach where the three prime weapons contractors develop receivers capable of operating in any of their Air Force weapons. The receivers are based on a common, internally-developed interface requirements specification (IRS), technology requirement document (TRD), and threat scenarios. This approach uses a combination of contract types based on acquisition phase (TMRR, Development, Production) and risk. The Weapons SPOs share a common development PE to allow flexibility in funding and planning, switching to individual PEs for receiver integration, operational testing, and production. The M-Code/EAJ Weapons Receiver Development effort leverages technology currently under development by the GPS-D MGUE program and will provide the warfighter with unmatched capability to operate in future A2/AD environments.

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604201F / <i>PNT Resiliency, Mods, and Improvements</i> | Project (Number/Name) 641030 / <i>GPS Receiver Development</i> |

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604201F / PNT Resiliency, Mods, and Improvements | Project (Number/Name) 641030 / GPS Receiver Development |
|--|--|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|---|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Common Weapons M-code Receiver Development (SDB II) | Various | Raytheon : Tucson, AZ | - | 17.000 | Apr 2018 | 23.970 | Jan 2019 | 31.900 | Oct 2019 | - | | 31.900 | Continuing | Continuing | - |
| Common Weapons M-code Receiver Development (CAAP ASIC) | MIPR | DMEA/Global Foundries : Hopewell Junction, NY | - | - | | 6.230 | Feb 2019 | - | | - | | - | Continuing | Continuing | - |
| Common Weapons M-code Receiver Development (JDAM/MOP/ SDB I Phase II) | Various | Boeing : St Louis, MO | - | 10.600 | Jun 2018 | 12.600 | Feb 2019 | 23.100 | Oct 2019 | - | | 23.100 | Continuing | Continuing | - |
| Common Weapons M-code Receiver Development (AJ ASIC) | Various | Collins Aerospace : Cedar Rapids, IA | - | 2.488 | Sep 2018 | 5.800 | Feb 2019 | 2.400 | Oct 2019 | - | | 2.400 | Continuing | Continuing | - |
| Common Weapons M-code Receiver Development (AJ ASIC / MIPR) | MIPR | DMEA/Global Foundries : Hopewell Junction, NY | - | 16.300 | Mar 2018 | 15.800 | Feb 2019 | 4.000 | Oct 2019 | - | | 4.000 | Continuing | Continuing | - |
| Common Weapons M-code Receiver Development (Pre-EMD JASSM) | Various | Lockheed Martin : Orlando, FL | - | 3.000 | May 2018 | 5.700 | Nov 2018 | 6.100 | Oct 2019 | - | | 6.100 | Continuing | Continuing | - |
| Common Weapons M-code Receiver Development (JASSM C+ + Phase II) | Various | Lockheed Martin : Orlando, FL | - | 1.800 | Jun 2018 | 5.300 | Nov 2018 | 4.900 | Oct 2019 | - | | 4.900 | Continuing | Continuing | - |
| Common Weapons M-code Receiver Development (JASSM MCU) | Various | Lockheed Martin : Orlando, FL | - | 2.000 | Sep 2018 | 3.871 | Feb 2019 | 18.200 | Oct 2019 | - | | 18.200 | Continuing | Continuing | - |
| Subtotal | | | - | 53.188 | | 79.271 | | 90.600 | | - | | 90.600 | Continuing | Continuing | N/A |

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|---|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604201F / PNT Resiliency, Mods, and Improvements | Project (Number/Name) 641030 / GPS Receiver Development |
|--|--|---|

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| M-Code Receiver Development PMA | Various | Various : TBD | - | 5.100 | Sep 2018 | 2.000 | Jun 2019 | 2.000 | Jun 2020 | - | | 2.000 | Continuing | Continuing | - |
| Subtotal | | | - | 5.100 | | 2.000 | | 2.000 | | - | | 2.000 | Continuing | Continuing | N/A |
| Project Cost Totals | | | - | 58.288 | | 81.271 | | 92.600 | | - | | 92.600 | Continuing | Continuing | N/A |

Remarks
PMA funding supports the required activities for executing this program including but not limited to travel between the weapon offices and all the associated aircraft weapons systems organizations.

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604201F / <i>PNT Resiliency, Mods, and Improvements</i> | Project (Number/Name) 641030 / <i>GPS Receiver Development</i> |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|--|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------------------------|------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| M-Code/EAJ Receivers | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| M-Code/EAJ Development/Integration | [REDACTED] | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| M-Code/EAJ Test and Evaluation | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604201F / <i>PNT Resiliency, Mods, and Improvements</i> | Project (Number/Name) 641030 / <i>GPS Receiver Development</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|------------------------------------|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>M-Code/EAJ Receivers</i> | | | | |
| M-Code/EAJ Development/Integration | 1 | 2018 | 2 | 2021 |
| M-Code/EAJ Test and Evaluation | 3 | 2020 | 4 | 2021 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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|--|--|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0604257F / <i>Advanced Technology and Sensors</i> |
|--|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|--|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 78.122 | 34.585 | 23.145 | 0.000 | 23.145 | 54.802 | 60.821 | 61.527 | 34.886 | Continuing | Continuing |
| 644818: <i>Imaging and Targeting Support</i> | - | 54.991 | 16.942 | 16.987 | 0.000 | 16.987 | 15.943 | 16.154 | 16.138 | 9.960 | Continuing | Continuing |
| 645148: <i>Common-Airborne Sense and Avoid (C-ABSAA)</i> | - | 21.647 | 17.643 | 6.158 | 0.000 | 6.158 | 38.859 | 44.667 | 45.389 | 24.926 | Continuing | Continuing |
| 646025: <i>Data Compression</i> | - | 1.484 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.484 |

A. Mission Description and Budget Item Justification

The Advanced Technology and Sensors (ATS) program coordinates the development of advanced technologies (sensors, data links, targeting networks and products, and quick reaction capabilities) in support of multiple airborne reconnaissance platforms, both manned and unmanned. Its objectives are to develop, demonstrate, and rapidly transition advanced, interoperable, multi-platform solutions to reduce the find, fix, target, and track kill chain timeline, and to provide safe separation and collision avoidance for remotely piloted aircraft. This program also coordinates the development of common collection, processing, and dissemination solutions for near-real time intelligence, surveillance, and reconnaissance. The ATS program also increases interoperability by developing common standards and interfaces.

The funds in this project are distributed in priority order for the goal of building a comprehensive Geospatial Intelligence (GEOINT) capability for the USAF. On an annual basis, developmental technologies are reviewed against warfighter capabilities and requirements based on strategic roadmaps and on the results of the Airborne Sensors for ISR Analysis of Alternatives, as prefaced in the Challenging Targets Initial Capabilities Document. Efforts advancing the technological maturity of promising sensors and processing capabilities are reviewed and prioritized into a recommended list for senior executive direction to implement in the coming year. The program office has the ability to initiate an I&TS project, within the GEOINT Capabilities Working Group (GCWG) construct but outside the normal annual GCWG vetting process, to expedite development and acquisition of urgently needed capabilities for the warfighter.

Funds in any project can also cover activities to include studies and analysis to support both current program planning and execution and future program planning. This program element may include necessary civilian pay expenses required to manage, execute, and deliver technology and sensor capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, 0605898F, and 0605833F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0604257F / <i>Advanced Technology and Sensors</i> |
|--|--|

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 68.719 | 34.585 | 33.145 | 0.000 | 33.145 |
| Current President's Budget | 78.122 | 34.585 | 23.145 | 0.000 | 23.145 |
| Total Adjustments | 9.403 | 0.000 | -10.000 | 0.000 | -10.000 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | -10.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 19.630 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | -0.227 | 0.000 | -10.000 | 0.000 | -10.000 |

Congressional Add Details (\$ in Millions, and Includes General Reductions)

Project: 644818: *Imaging and Targeting Support*

Congressional Add: *Advanced Synthetic Aperture Radar System (ASARS) 2B Congressional Add*

Congressional Add Subtotals for Project: 644818

Congressional Add Totals for all Projects

| | FY 2018 | FY 2019 |
|--|----------------|----------------|
| | 11.500 | 0.000 |
| | 11.500 | 0.000 |
| | 11.500 | 0.000 |

Change Summary Explanation

In FY 2018, 0604257F PE received \$11.5M Congressional add for ASARS-2B, \$8.13M Congressional add for H-Chip development, and -\$10M Congressional reductions for I&TS unjustified growth. In FY20, -\$10M realigned for higher Air Force priorities

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|---|--------------------|----------------|----------------|---------------------|--|----------------------|----------------|----------------|---|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 4 | | | | | R-1 Program Element (Number/Name) PE 0604257F / <i>Advanced Technology and Sensors</i> | | | | Project (Number/Name) 644818 / <i>Imaging and Targeting Support</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 644818: <i>Imaging and Targeting Support</i> | - | 54.991 | 16.942 | 16.987 | 0.000 | 16.987 | 15.943 | 16.154 | 16.138 | 9.960 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

The purpose of the Imaging and Targeting Support (I&TS) project is to develop, mature, demonstrate, and rapidly transition next-generation, persistent, wide area surveillance and common imagery reconnaissance sensor capabilities (active and passive systems), including sensor data processing, for multiple airborne platforms, as well as sensor products to aid in rapid targeting (e.g., eolocation models, sensor-based exploitation tools, sensor networking capabilities).

Developmental efforts pursued include: improved sensor capabilities such as Hyperspectral Imagery (HSI), Measurement and Signature Intelligence (MASINT), Polarimetric Imaging (PI), Ground and Dismount Moving target indicator (GMTI/ DMTI), maritime search/track, Inverse Synthetic Aperture Radar, Foliage Penetration (FOPEN) and additional radar, Electro-Optical (EO), nuclear event detection, and other modalities; increased geolocation accuracy; increased dismount detection capability; advanced sensor data correlation; automated target detection/recognition; Artificial Intelligence (AI): Machine Learning (ML): network centric warfare; and other ISR and associated planning and direction; collection; processing and exploitation; analysis and production; and dissemination capabilities. These efforts are intended to reduce both target search and kill chain timelines as well as supporting traditional intelligence activities. This project will also increase interoperability by developing common standards (e.g. Open Mission Systems (OMS), Sensor Open System Architecture (SOSA), Common Open Architecture Reconnaissance Processor Standard (COARPS), AgilePod and data reduction) and interfaces.

The funds in this project are distributed in priority order for the goal of building a comprehensive GEOINT/Multi-INT capability for the USAF. On an annual basis, developmental technologies are reviewed against warfighter capabilities and requirements based on strategic roadmaps and on the results of the Airborne Sensors for ISR Analysis of Alternatives, as prefaced in the Challenging Targets Initial Capabilities Document. Efforts advancing the technological maturity of promising sensors and processing capabilities are reviewed and prioritized into a recommended list for senior executive direction to implement in the coming year. The program office has the ability to initiate an I&TS project outside of the normal GCWG process to support rapid development, demonstration and/or acquisition of urgently needed capabilities.

Traditional focus areas include, but are not limited to: development, demonstration, and rapid transition of common radar and EO sensors (Synthetic Aperture Radar (SAR), Low Frequency SAR, antenna, Infrared (IR), Hyperspectral Imagery (HSI), Light Detection And Ranging (LIDAR) and their operational modes (high resolution imagery, Ground and Dismount Moving Target Indicator (GMTI/DMTI), persistent surveillance, wide area motion imagery, Spectral Identification) for multiple airborne platforms at all altitudes; development and demonstration of advanced tactical sensor and associated tasking, processing, exploitation, and dissemination processing algorithms and tools (automatic registration, automatic and assisted target detection, network centric warfare, etc); development of integrated multi-sensor capabilities to detect and identify obscured targets; development and implementation of standards (Common GMTI/DMTI, National Imagery Transmission Format; and monitoring and enhancement of Imagery Intelligence product quality (radar and EO/IR imagery, GMTI data, and spectral information) and timeliness throughout the image chain (from sensor to user); and development and integration of airborne sensors to support an open stems architecture pod capability. These efforts focus on reducing the find, fix and track elements of the time critical targeting kill-chain timeline while improving operator and decision-maker efficiency and effectiveness.

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604257F / <i>Advanced Technology and Sensors</i> | Project (Number/Name) 644818 / <i>Imaging and Targeting Support</i> |

Activities also include studies and analysis to support both current program planning and execution and future program planning. This program element may include necessary civilian pay expenses required to manage, execute, and deliver technology and sensor capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, 0605898F, and 0605833F.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| <p>Title: Imaging & Targeting Support (I&TS)</p> <p>Description: Corporately prioritized Air Force Multi-INT Portfolio of projects to develop and demonstrate next generation airborne sensors and processing technologies to further the art of the possible and/or transition ISR capabilities (ex: radar improvement, next-generation HSI, LIDAR, ISR Standards, EO/IR, and data mitigation technologies).</p> <p>FY 2019 Plans: Continue development, modernization, and demonstration of advanced sensors and detection and processing algorithms, hyperspectral imaging technologies, multiband EO/IR and SAR sensor systems, enhanced LIDAR capabilities, polarimetric imaging (PI), and other GEOINT sensing modalities for Anti-Access Area Denial, permissive and non-permissive environments, foliage penetration, and littoral environments as well as other prioritized GCWG technology efforts. Other efforts include but are not limited to MTS-B, DRACO 4.0, Advanced Large Optical Freeform Telescope (ALOFT), CERBERUS (Full Spectrum HSI in AgilePod). Standoff High-altitude Enhanced Reconnaissance Long-range Operational Concept (SHERLOC), Predator/Reaper Off-board Sensing and Improved Targeting (PROSIT), SUAS Tactical Agile Gimbal (STAG), H-Chip, and other projects supporting rapid acquisition and Advanced Technology Demonstration (ATDs).</p> <p>FY 2020 Plans: - Will continue development, modernization, and demonstration of advanced sensors and detection and processing algorithms, HSI technologies, multiband EO/IR and SAR sensor systems, enhanced LIDAR capabilities, PI technologies, and other GEOINT sensing modalities for Anti-Access Area Denial, permissive and non-permissive environments, foliage penetration, and littoral environments as well as other Multi-INT technology efforts. Other efforts include but are not limited to CERBERUS (Full Spectrum HSI in AgilePod), SHERLOC, ALOFT, COARPS, AgilePod, AI/ML, PROSIT, STAG, H-Chip (Hyperspectral on a Chip), LIDAR, and other projects supporting Advanced Technology Demonstration (ATDs) and rapid acquisition.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY20 increased funding to support GCWG approved projects.</p> | 31.270 | 15.492 | 16.987 |
| <p>Title: Advanced Synthetic Aperture Radar System (ASARS) 2B</p> <p>Description: Develop/design/fabricate/integrate/demonstrate/test and field deep look high altitude ISR radar capabilities.</p> <p>FY 2019 Plans:</p> | 12.221 | 1.450 | 0.000 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604257F / <i>Advanced Technology and Sensors</i> | Project (Number/Name) 644818 / <i>Imaging and Targeting Support</i> | | |
| B. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| - Continue to develop/design/fabricate/integrate/demonstrate/test and field deep look high altitude ISR radar capabilities. | | | | |
| FY 2020 Plans: N/A | | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: Decrease from FY19 to FY20 due to efforts transferred to PE 0305206F, BPAC 674818. | | | | |
| Accomplishments/Planned Programs Subtotals | | 43.491 | 16.942 | 16.987 |
| | | FY 2018 | FY 2019 | |
| Congressional Add: Advanced Synthetic Aperture Radar System (ASARS) 2B Congressional Add | | 11.500 | 0.000 | |
| FY 2018 Accomplishments: None | | | | |
| FY 2019 Plans: - Continue to develop/design/fabricate/integrate/demonstrate/test and field deep look high altitude ISR radar capabilities. | | | | |
| Congressional Adds Subtotals | | 11.500 | 0.000 | |
| C. Other Program Funding Summary (\$ in Millions) | | | | |
| N/A | | | | |
| Remarks | | | | |
| D. Acquisition Strategy | | | | |
| Imaging and Targeting Support efforts are prioritized on an annual basis by the GCWG, in accordance with the validated gaps in the Challenging Targets Initial Capabilities Document. Resulting funded efforts are then contracted for and/or executed by either various program offices, laboratories, industry, and/or other government agencies. | | | | |
| Acquisition strategy is to maximize commercial and national development efforts and investment through multiple contracting methods, including the use of Engineering Change Proposals to modify existing contracts and new contracts that were awarded both competitively or on a sole source basis. | | | | |
| E. Performance Metrics | | | | |
| Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission. | | | | |

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604257F / <i>Advanced Technology and Sensors</i> | Project (Number/Name) 644818 / <i>Imaging and Targeting Support</i> |
|--|--|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|---------------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| MTS-B Track Through Launch Transient | SS/CPFF | Raytheon : McKinney, TX | - | 0.172 | Nov 2017 | - | | - | | - | | - | Continuing | Continuing | - |
| DRACO 4.0 | SS/CPFF | Lockheed Martin : King of Prussia, PA | - | 1.588 | Nov 2017 | - | | - | | - | | - | Continuing | Continuing | - |
| MQ-9 Systema Speedloader | C/CPAF | TBD : TBD | - | 1.800 | Sep 2018 | - | | - | | - | | - | Continuing | Continuing | - |
| ALOFT | SS/CPFF | UTC Aerospace Systems : Westford, MA | - | 0.500 | Dec 2017 | 1.235 | Mar 2019 | - | | - | | - | Continuing | Continuing | - |
| SHERLOC | SS/CPFF | UTAS : Westford, MA | - | 0.750 | Oct 2018 | 4.745 | Nov 2018 | 4.700 | Dec 2019 | - | | 4.700 | Continuing | Continuing | - |
| H-Chip | SS/CPFF | EO Vista : Acton, MA | - | 11.100 | Jan 2018 | 4.030 | Dec 2018 | - | | - | | - | Continuing | Continuing | - |
| SUAS Tactical Agile Gimbal (STAG) | SS/CPFF | Not specified. : TBD | - | 3.928 | Feb 2018 | 0.597 | Nov 2018 | - | | - | | - | Continuing | Continuing | - |
| Predator/Reaper Off-board Sensing and Improved Targeting (PROSIT) | SS/CPFF | Various : Various, OH | - | 3.700 | Feb 2018 | 1.963 | Nov 2018 | - | | - | | - | Continuing | Continuing | 4.750 |
| Other Technology Efforts (Prioritized by GCWG) | Various | Various : Various | - | 6.860 | Dec 2017 | - | | 10.287 | Dec 2019 | - | | 10.287 | Continuing | Continuing | - |
| ASARS 2B Technical Demonstration | SS/CPFF | Raytheon : El Segundo, CA | - | 12.766 | Dec 2017 | - | | - | | - | | - | 0.000 | 12.766 | - |
| ASARS-2B operationalization | SS/CPFF | Raytheon : El Segundo, CA | - | 4.421 | Feb 2019 | 1.450 | Feb 2019 | - | | - | | - | 0.000 | 5.871 | - |
| Subtotal | | | - | 47.585 | | 14.020 | | 14.987 | | - | | 14.987 | Continuing | Continuing | N/A |

Remarks
 On an annual basis, the GEOINT Capabilities Working Group reviews developmental technologies against warfighter capabilities and requirements based on strategic roadmaps and on the Airborne Sensors for ISR Analysis of Alternatives. Projects advancing the technological maturity of promising sensors and processing capabilities are reviewed and prioritized into a recommended list for senior executive direction to implement for the coming fiscal year.

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| Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force | | | | | | | | | | | | Date: February 2019 | | | |
| Appropriation/Budget Activity 3600 / 4 | | | | | R-1 Program Element (Number/Name) PE 0604257F / Advanced Technology and Sensors | | | | | Project (Number/Name) 644818 / Imaging and Targeting Support | | | | | |

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | | | |
|---------------------------|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | Target Value of Contract |
| Flight Test Range Support | Various | Various : Various, CA | - | 1.994 | Jun 2018 | - | | - | | - | | - | 0.000 | 1.994 | - |
| Subtotal | | | - | 1.994 | | - | | - | | - | | - | 0.000 | 1.994 | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | | | |
|--------------------------------------|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | Target Value of Contract |
| PMA: Other Govt Cost | Various | Various : Dayton, OH | - | 5.412 | Nov 2017 | 2.922 | Nov 2018 | 2.000 | Nov 2019 | - | | 2.000 | Continuing | Continuing | - |
| Subtotal | | | - | 5.412 | | 2.922 | | 2.000 | | - | | 2.000 | Continuing | Continuing | N/A |

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|
| Project Cost Totals | - | 54.991 | 16.942 | 16.987 | - | 16.987 | Continuing | Continuing | N/A |

Remarks

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604257F / <i>Advanced Technology and Sensors</i> | Project (Number/Name) 644818 / <i>Imaging and Targeting Support</i> |

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
|--|--|
| Imaging and Targeting Support | |
| ITS - Advanced SAR Development | |
| - CERBERUS (Full Spectrum HSI AgilePod) | |
| ITS - EO/IR | |
| - MTS-B Track Through Launch Transient | |
| - SHERLOC | |
| - H-Chip | |
| -ALOFT | |
| - Predator/Reaper Offboard Sensing and Improved Targeting (PROSIT) | |
| - SUAS Tactical Agile Gimbal (STAG) (MSGLPS 5" Gimbal Laser) | |
| ITS - LIDAR | |
| ITS - Other Technology Efforts (Prioritized by GCWG) | |
| Advanced Airborne PCPAD-E Development | |
| - DRACO 4.0 | |
| - MQ-9 Systema Speedloader | |
| MARLIE | |
| ASARS-2B Technical Demonstration | |
| ASARS-2B NRE, test, required activities for operationalization | |
| - NRE Contract Award (Feb 2019) | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604257F / <i>Advanced Technology and Sensors</i> | Project (Number/Name) 644818 / <i>Imaging and Targeting Support</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Imaging and Targeting Support</i> | | | | |
| ITS - Advanced SAR Development | 1 | 2018 | 4 | 2024 |
| - CERBERUS (Full Spectrum HSI AgilePod) | 1 | 2018 | 4 | 2019 |
| ITS - EO/IR | 1 | 2018 | 4 | 2024 |
| - MTS-B Track Through Launch Transient | 1 | 2018 | 2 | 2019 |
| - SHERLOC | 1 | 2019 | 4 | 2020 |
| - H-Chip | 1 | 2018 | 3 | 2020 |
| -ALOFT | 1 | 2019 | 1 | 2020 |
| - Predator/Reaper Offboard Sensing and Improved Targeting (PROSIT) | 1 | 2018 | 2 | 2021 |
| - SUAS Tactical Agile Gimbal (STAG) (MSGLPS 5" Gimbal Laser) | 1 | 2018 | 4 | 2019 |
| ITS - LIDAR | 1 | 2018 | 4 | 2024 |
| ITS - Other Technology Efforts (Prioritized by GCWG) | 1 | 2018 | 4 | 2024 |
| Advanced Airborne PCPAD-E Development | 1 | 2018 | 4 | 2024 |
| - DRACO 4.0 | 1 | 2018 | 2 | 2019 |
| - MQ-9 Systema Speedloader | 1 | 2019 | 4 | 2020 |
| MARLIE | 1 | 2019 | 1 | 2020 |
| ASARS-2B Technical Demonstration | 1 | 2018 | 3 | 2019 |
| ASARS-2B NRE, test, required activities for operationalization | 2 | 2019 | 2 | 2019 |
| - NRE Contract Award (Feb 2019) | 2 | 2019 | 2 | 2019 |

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|---|--------------------|----------------|----------------|---------------------|--|----------------------|----------------|----------------|---|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 4 | | | | | R-1 Program Element (Number/Name) PE 0604257F / <i>Advanced Technology and Sensors</i> | | | | Project (Number/Name) 645148 / <i>Common-Airborne Sense and Avoid (C-ABSAA)</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 645148: <i>Common-Airborne Sense and Avoid (C-ABSAA)</i> | - | 21.647 | 17.643 | 6.158 | 0.000 | 6.158 | 38.859 | 44.667 | 45.389 | 24.926 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

The Common-Airborne Sense and Avoid (C-ABSAA) program provides Group 4 and 5 Remotely Piloted Aircraft (RPA) with the ability to safely and effectively operate in all classes of airspace worldwide. The program acts as a replacement for the sense and avoid capability of the pilot on board a manned aircraft.

The Air Force is pursuing a software intensive approach to maintain safe separation, avoid collisions, and provide the ability to safely integrate with other airspace users. The software solutions identified in this Information System Capability Development Document (IS-CDD) are open and modular and accept inputs from any type of sensor or data link and will operate any legacy and future Group 4 and 5 RPA. The effort includes technology maturation, risk reduction, EMD and life-cycle costs, such as: 1) prototyping activities, 2) agile development, test and implementation of the software, 3) development of open system architecture using modular design, standards-based interfaces, and widely-supported consensus-based standards, and 4) collaboration with the Federal Aviation Agency (FAA), National Aeronautics and Space Administration (NASA), and other services to develop national policy and standards.

The program element may include necessary civilian pay expenses required to manage, execute, and deliver technology and sensor capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, 0605898F, and 0605833F.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| Title: Sense and Avoid (SAA)-Related Activities | 21.647 | 17.643 | 6.158 |
| Description: Conduct risk reduction and prototyping activities to improve affordability, reduce cost, schedule and technical risk entering next milestone. | | | |
| FY 2019 Plans: | | | |
| - Continue C-ABSAA Technology Maturation & Risk Reduction Phase | | | |
| - Support validation of IS CDD and System Requirements Document/Technical Requirements Document | | | |
| - Prepare/present all documentation/results as part of C-ABSAA Milestone decision review | | | |
| - Continue collaborating with FAA, NASA, and other Services and agencies on national policy and standards | | | |
| - Continue development/test/certification of open modular architecture processes, standards and design | | | |
| FY 2020 Plans: | | | |
| - Will continue C-ABSAA Technology Maturation & Risk Reduction Phase | | | |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604257F / <i>Advanced Technology and Sensors</i> | Project (Number/Name) 645148 / <i>Common-Airborne Sense and Avoid (C-ABSAA)</i> |
|--|--|---|

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|---------|---------|---------|
| <ul style="list-style-type: none"> - Will prepare all documentation/results in anticipation of C-ABSAA Milestone decision review - Will continue to collaborate with FAA, NASA, and other Services and agencies on national policy and standards - Will continue development/test/certification of open modular architecture processes, standards and design <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> Funding decreased from FY19 to FY20 due to higher Air Force priorities</p> | | | |
| Accomplishments/Planned Programs Subtotals | 21.647 | 17.643 | 6.158 |

C. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

D. Acquisition Strategy

The IS CDD requirements uses an iterative and incremental approach to develop, test and implement high quality software in a cost effective and timely manner. The software utilizes Open System Architecture (OSA) principles, COTS, Application Programming Interfaces (APIs), and maximum software and interface module independence. C-ABSAA will integrate applicable Better Buying Power 3.0 initiatives throughout its acquisition lifecycle.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604257F / <i>Advanced Technology and Sensors</i> | Project (Number/Name) 645148 / <i>Common-Airborne Sense and Avoid (C-ABSAA)</i> |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| <i>Common-Airborne Sense and Avoid</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Analysis of Alternatives | | ■ | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Matériel Solution Analysis | | ■ | ■ | ■ | ■ | | | | | | | | | | | | | | | | | | | | | | | |
| Information Systems Capability Development Document | | | ■ | ■ | ■ | | | | | | | | | | | | | | | | | | | | | | | |
| Milestone A (Mar 2019) | | | | | | ■ | | | | | | | | | | | | | | | | | | | | | | |
| Technology Maturation and Risk Reduction | | | | | | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | | | | | | | | | |
| Milestone B (Feb 2021) | | | | | | | | | | | | | | ■ | | | | | | | | | | | | | | |
| Engineering and Manufacturing Development | | | | | | | | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604257F / <i>Advanced Technology and Sensors</i> | Project (Number/Name) 645148 / <i>Common-Airborne Sense and Avoid (C-ABSAA)</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|---|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Common-Airborne Sense and Avoid</i> | | | | |
| Analysis of Alternatives | 2 | 2018 | 2 | 2018 |
| Materiel Solution Analysis | 2 | 2018 | 2 | 2019 |
| Information Systems Capability Development Document | 3 | 2018 | 1 | 2019 |
| Milestone A (Mar 2019) | 2 | 2019 | 2 | 2019 |
| Technology Maturation and Risk Reduction | 3 | 2019 | 2 | 2021 |
| Milestone B (Feb 2021) | 2 | 2021 | 2 | 2021 |
| Engineering and Manufacturing Development | 2 | 2021 | 4 | 2024 |

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604257F / <i>Advanced Technology and Sensors</i> | Project (Number/Name) 646025 / <i>Data Compression</i> |
|--|--|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---------------------------------|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| 646025: <i>Data Compression</i> | - | 1.484 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.484 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

Note

In FY 2019, PE 0604257, Advanced Technology and Sensors, Data Compression effort was transferred to PE 0305206F, Airborne Reconnaissance Systems (ARS), Project 676025, Data Compression.

A. Mission Description and Budget Item Justification

The Data Compression effort provides the warfighter with capability to efficiently compress and decompress airborne ISR sensor data and transmit near real time to tactical users through current and future bandwidth limited commercial satellite communications (SATCOM) or military SATCOM. The effort develops, tests, and will implement new sensor data compression and decompression algorithms for current and emerging airborne ISR sensors. Additionally, the program develops compression and decompression capabilities for manned and unmanned airborne platforms, associated ground stations, and Distributed Common Ground System (DCGS). Outputs will meet standard certification for use within the Department of Defense GEOINT and Measurement and Signatures Intelligence(MASINT) architectures. This program element may include necessary civilian pay expenses required to manage, execute, and deliver technology and sensor capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, 0605898F, and 0605833F.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|--|---------|---------|---------|
| Title: Reduction of Data Using Compression Enhancements (RDUCE) | 1.484 | 0.000 | 0.000 |
| Description: The Data Compression effort provides the warfighter a capability to efficiently compress and decompress airborne Intelligence, Surveillance, and Reconnaissance (ISR) sensor data and transmit near real time to tactical users through current and future bandwidth limited commercial satellite communications (SATCOM) or military SATCOM. The effort will develop, test and implement new sensor data compression and decompression algorithms for current and emerging airborne ISR sensors. Additionally, the program develops compression and decompression capabilities for manned and unmanned airborne platforms, associated ground stations, and the DCGS. Outputs will meet standard certification for use within the Department of Defense GEOINT and MASINT architectures. | | | |
| FY 2019 Plans: N/A - In FY 2019, PE 0604257, Advanced Technology and Sensors, Data Compression effort was transferred to PE 0305206F, Airborne Reconnaissance Systems (ARS), Project 676025, Data Compression. | | | |
| FY 2020 Plans: | | | |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604257F / <i>Advanced Technology and Sensors</i> | Project (Number/Name) 646025 / <i>Data Compression</i> | | |
| B. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| N/A | | | | |
| <i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> In FY 2019, PE 0604257, Advanced Technology and Sensors, Data Compression effort was transferred to PE 0305206F, Airborne Reconnaissance Systems (ARS), Project 676025, Data Compression. | | | | |
| Accomplishments/Planned Programs Subtotals | | 1.484 | 0.000 | 0.000 |
| C. Other Program Funding Summary (\$ in Millions) | | | | |
| N/A | | | | |
| Remarks | | | | |
| D. Acquisition Strategy | | | | |
| The Data Compression acquisition approach is to design and develop compression and decompression technology hardware and software components, interfaces and standards for various airborne intelligence, surveillance, and reconnaissance platforms, ground stations, data storage facilities, and exploitation tools utilizing existing contracts with full and open competition where appropriate. Integration will be accomplished by the requisite program offices. | | | | |
| E. Performance Metrics | | | | |
| Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission. | | | | |

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| Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force | | | | | | | | | | | | | Date: February 2019 | | |
|--|-----------------------------------|---|--------------------|----------------|--|---------------------|-------------------|---------------------|-------------------|--|-------------------------|----------------------|---------------------------------|-------------------|---------------------------------|
| Appropriation/Budget Activity 3600 / 4 | | | | | R-1 Program Element (Number/Name) PE 0604257F / <i>Advanced Technology and Sensors</i> | | | | | Project (Number/Name) 646025 / <i>Data Compression</i> | | | | | |
| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | | | |
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | Target Value of Contract |
| Technology Development | C/CPFF | General Atomics : San Diego, CA | - | 1.312 | | - | | - | | - | | - | 0.000 | 1.312 | - |
| Subtotal | | | - | 1.312 | | - | | - | | - | | - | 0.000 | 1.312 | N/A |
| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | | | |
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | Target Value of Contract |
| Program Office Support | Various | Govt/Contractors : Dayton, NV | - | 0.172 | Oct 2017 | - | | - | | - | | - | 0.000 | 0.172 | - |
| Subtotal | | | - | 0.172 | | - | | - | | - | | - | 0.000 | 0.172 | N/A |
| | | | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract | | |
| Project Cost Totals | | | - | 1.484 | 0.000 | - | | - | | - | 0.000 | 1.484 | N/A | | |
| Remarks | | | | | | | | | | | | | | | |

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604257F / <i>Advanced Technology and Sensors</i> | Project (Number/Name) 646025 / <i>Data Compression</i> |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|--|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
|---|--|
| <i>RDUCE</i> | |
| Persistent E/O IR Data Compression Development | |
| --LIDAR Integration | |
| Phase History SAR Data Compression Development | |
| --ASARS 2B Integration | |
| -- Phase History SAR Data Compression Demonstration | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604257F / <i>Advanced Technology and Sensors</i> | Project (Number/Name) 646025 / <i>Data Compression</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|---|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>RDUCE</i> | | | | |
| Persistent E/O IR Data Compression Development | 1 | 2018 | 4 | 2018 |
| --LIDAR Integration | 1 | 2018 | 4 | 2018 |
| Phase History SAR Data Compression Development | 1 | 2018 | 4 | 2018 |
| --ASARS 2B Integration | 1 | 2018 | 4 | 2018 |
| -- Phase History SAR Data Compression Demonstration | 1 | 2018 | 4 | 2018 |

Note

In FY 2015, efforts were reported under PE 0305208F, Distributed Common Ground/Surface Systems, Project 676025, Data Compression.
 In FY 2016, efforts were reported in PE 0305206F, Airborne Reconnaissance Systems, Project 676025, Data Compression.
 In FY 2017, PE 0305206F, Airborne Reconnaissance Systems, Project 676025, Data Compression, efforts transferred to PE 0604257F, Advanced Technology and Sensors, Project 646025, Data Compression.
 In FY 2019, PE 0604257, Advanced Technology and Sensors, Data Compression effort was transferred to PE 0305206F, Airborne Reconnaissance Systems (ARS), Project 676025, Data Compression.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0604288F / <i>National Airborne Ops Center (NAOC) Recap</i> |
|--|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---------------------------------------|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 6.141 | 7.440 | 16.669 | 0.000 | 16.669 | 102.739 | 136.684 | 138.000 | 141.000 | Continuing | Continuing |
| 646507: <i>NAOC Recap Development</i> | - | 6.141 | 7.440 | 16.669 | 0.000 | 16.669 | 102.739 | 136.684 | 138.000 | 141.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

Note
In FY2018, PE 0302015F, E-4B National Airborne Operations Center (NAOC) Project 674777, E-4B Aircraft Modernization efforts were transferred to PE 0604288F, National Airborne Ops Center (NAOC) Recap, Project 646507, NAOC Recap Development, in order to provide greater transparency and consolidate efforts.

A. Mission Description and Budget Item Justification

The E-4B National Airborne Operations Center (NAOC) is a survivable node of the National Military Command System (NMCS), providing POTUS, SECDEF and the CJCS a worldwide, survivable, and enduring node of the NMCS to fulfill national security requirements throughout all stages of conflict. As a command, control and communications center directing US forces, executing emergency war orders and coordinating the activities of civil authorities including national contingency plans, this capability ensures continuity of operations plans and continuity of government as required in a national emergency or after negation/destruction of ground command and control centers.

The E-4B NAOC Recapitalization effort will replace the aging E-4B fleet which faces capability gaps, diminishing manufacturing sources, increased maintenance costs, and parts obsolescence as it approaches the end of its serviceable life. The recapitalization effort will be informed by Air Force and Department of Defense analyses used to determine a holistic approach to replacing the aging E-4B fleet and integrating its capabilities with other nuclear and national command and control mission sets.

In 2015, the Joint Staff completed a Mission Area Analysis (MAA) focused on the Nuclear Command, Control and Communication (NC3) National Military Command system (NMCS) airborne fleets. This analysis examined alternative architectures and CONOPS for achieving requirements, and suggested potential programmatic, platform, and/or mission system synergies across and between fleet recapitalization programs (E-4B, E-6B, VC-25, C-32A). Further, the Joint Staff documented the essential functions necessary to execute Nuclear Command and Control, and defined the operational role of the NC2 enterprise out to 2030 in a NC2 CONOPS. From 2014-2016, the Joint Staff performed an NC2 Capabilities Based Assessment (CBA) to determine potential gaps in the NC2 mission and architecture. The findings of these studies have culminated in an evolved NMCS "aerial layer mission alignment strategy" that may allow the Department of Defense (DoD) to consolidate the airborne command center capabilities provided by the E-4B and E-6B into an optimized fleet of appropriately configured aircraft. This concept is known as the Survivable Airborne Operations Center, or SAOC.

This program element may include necessary civilian pay expenses (direct cite) required to manage, execute, and deliver E-4B weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, and 0605898F.

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0604288F / <i>National Airborne Ops Center (NAOC) Recap</i> |
|--|--|

Furthermore, it includes support funding for emerging requirements to support program office operations, management services (FFRDC, A&AS, etc.), PMS, equipment and other as required.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 7.850 | 9.740 | 19.549 | 0.000 | 19.549 |
| Current President's Budget | 6.141 | 7.440 | 16.669 | 0.000 | 16.669 |
| Total Adjustments | -1.709 | -2.300 | -2.880 | 0.000 | -2.880 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | -1.500 | -2.300 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -0.209 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | -2.880 | 0.000 | -2.880 |

Change Summary Explanation

FY18: Congressional Mark -\$1.5M sited "Maintain program affordability, Recap excess to need".

FY19: Congressional Mark -\$2.3M sited " Materiel solution analysis funding early to need."

FY20: Re-phased -\$2.88M from FY20 into FY21 (+\$1.728M) and FY22 (+\$1.152M)

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| Title: E-4B NAOC Recap | 6.141 | 7.440 | 16.669 |
| Description: Efforts will involve early acquisition activities, to include but not limited to, preparation for an acquisition entry decision, completion of the Analysis of Alternatives (AoA), development of initial requirements/acquisition strategy, risk reduction activities, and other efforts necessary to initiate a recapitalization program. | | | |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0604288F / <i>National Airborne Ops Center (NAOC) Recap</i> |
|--|--|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| <p><i>FY 2019 Plans:</i> Complete AoA and continue Materiel Solution Analysis activities. Establish program office and staff to accomplish pre-acquisition activities leading to a MS A or MS B decision dependent on the outcome of the AoA.</p> <p><i>FY 2020 Plans:</i> Complete Materiel Solution Analysis activities. Continue program office stand up, pre-EMD studies and risk reduction activities, and other efforts necessary to a recapitalization program.</p> <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> FY20 increases efforts to support pre-EMD planning and activities and continues stand up of program office.</p> | | | |
| Accomplishments/Planned Programs Subtotals | 6.141 | 7.440 | 16.669 |

| D. Other Program Funding Summary (\$ in Millions) | | | | | | | | | | | |
|--|----------------|----------------|-------------------------|------------------------|--------------------------|----------------|----------------|----------------|----------------|-----------------------------|-------------------|
| Line Item | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| • RDTE 07 PE 0302015F: <i>E-4B National Airborne Operations Center (NAOC)</i> | 37.481 | 57.758 | 70.173 | - | 70.173 | 3.474 | 136.684 | 0.000 | 0.000 | 0.000 | 305.570 |

Remarks

E. Acquisition Strategy

The E-4B Recapitalization program is currently in the Materiel Solution Analysis phase. After completing the program's Analysis of Alternatives (AoA), a formal acquisition strategy will follow.

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|---|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604288F / National Airborne Ops Center (NAOC) Recap | Project (Number/Name) 646507 / NAOC Recap Development |
|--|---|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Analysis of Alternatives and Studies | MIPR | Various : TBD | - | 2.500 | Jun 2018 | 3.749 | Oct 2018 | - | | - | | - | Continuing | Continuing | - |
| Risk Reduction Studies | MIPR | Various : TBD | - | 0.802 | Jun 2018 | - | | - | | - | | - | Continuing | Continuing | - |
| Pre-EMD Studies and Activities | TBD | TBD : TBD | - | - | | - | | 11.750 | Jan 2020 | - | | 11.750 | Continuing | Continuing | - |
| Subtotal | | | - | 3.302 | | 3.749 | | 11.750 | | - | | 11.750 | Continuing | Continuing | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|---|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| FFRDC | Various | Various : Bedford, MA : Hanscom AFB, MA | - | 1.844 | Jun 2018 | 1.697 | Oct 2018 | 1.950 | Oct 2019 | - | | 1.950 | Continuing | Continuing | - |
| EPASS (A&AS) | Various | Various : Bedford, MA : Hanscom AFB, MA | - | 0.000 | | 1.216 | Nov 2018 | 1.320 | Nov 2019 | - | | 1.320 | Continuing | Continuing | - |
| PMA - Other | Various | Various : Bedford, MA : Hanscom AFB, MA | - | 0.995 | Jun 2018 | 0.778 | Oct 2018 | 1.649 | Oct 2019 | - | | 1.649 | Continuing | Continuing | - |
| Subtotal | | | - | 2.839 | | 3.691 | | 4.919 | | - | | 4.919 | Continuing | Continuing | N/A |

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract | |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|-----|
| Project Cost Totals | | - | 6.141 | 7.440 | 16.669 | - | 16.669 | Continuing | Continuing | N/A |

Remarks
 Costs associated with development planning, risk reduction and preliminary planning activities including systems engineering strategy and analysis; completion and reporting of the Analysis of Alternatives.

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604288F / <i>National Airborne Ops Center (NAOC) Recap</i> | Project (Number/Name) 646507 / <i>NAOC Recap Development</i> |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|--|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| NAOC Recap Development | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Analysis of Alternatives | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Material Solution Analysis | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pre-EMD Studies and Activities | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Milestone B | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| EMD | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604288F / <i>National Airborne Ops Center (NAOC) Recap</i> | Project (Number/Name) 646507 / <i>NAOC Recap Development</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--------------------------------------|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>NAOC Recap Development</i> | | | | |
| Analysis of Alternatives | 4 | 2018 | 1 | 2020 |
| Materiel Solution Analysis | 4 | 2018 | 1 | 2020 |
| Pre-EMD Studies and Activities | 2 | 2020 | 2 | 2022 |
| Milestone B | 2 | 2022 | 2 | 2022 |
| EMD | 2 | 2022 | 4 | 2024 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0604317F / <i>Technology Transfer</i> |
|--|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|--|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 17.644 | 16.924 | 23.614 | 0.000 | 23.614 | 13.662 | 13.732 | 13.792 | 14.030 | Continuing | Continuing |
| 646003: <i>Partnership Intermediary Agreement(s)</i> | - | 17.644 | 6.999 | 3.096 | 0.000 | 3.096 | 3.146 | 3.213 | 3.271 | 3.330 | Continuing | Continuing |
| 646030: <i>AFwerX</i> | - | 0.000 | 9.925 | 20.518 | 0.000 | 20.518 | 10.516 | 10.519 | 10.521 | 10.700 | 0.000 | 72.699 |

A. Mission Description and Budget Item Justification

The Technology Transfer Program captures and manages all intellectual property (IP) (patents and inventions) developed by the Air Force and leads efforts to transfer the IP to commercial sector for the production and transition of the technology to the warfighter.

TechLink, Department of Defense's (DoD)'s first National level Partnership Intermediary (PI), directly supports these activities for all Air Force, Army, Navy, and independent DoD Research Laboratories. TechLink brokers technology transfer agreements between DoD laboratories and US industry for the manufacture and use of DoD inventions. These agreements enable DoD to leverage the investment and capabilities of the private-sector in development of new defense-related products and services, lowering DoD costs and also helping ensure that DoD-developed or co-developed technologies are transitioned to DoD operational use. This program impacts virtually all technology fields, including medicine, software, electronics, communications, advanced materials, and energy-related technologies.

In FY 2019, Project 646030, AFWERX, was created under this program element to provide centralized funding for AFWERX activities. AFWERX links innovators to the Air Force's research and development activities, program offices, development planning & experimentation teams, and end users. These linkages will create capability options and prototype opportunities for the Air Force. AFWERX was previously funded in FY 2017 and FY 2018 with execution year funding from various Air Force Science and Technology (S&T) RDT&E program elements.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver AFWERX capabilities. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, 0605898F, and 0605833F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0604317F / <i>Technology Transfer</i> |
|--|--|

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 3.295 | 12.960 | 13.021 | 0.000 | 13.021 |
| Current President's Budget | 17.644 | 16.924 | 23.614 | 0.000 | 23.614 |
| Total Adjustments | 14.349 | 3.964 | 10.593 | 0.000 | 10.593 |
| • Congressional General Reductions | -0.022 | -0.036 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 15.000 | 4.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -0.629 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 10.593 | 0.000 | 10.593 |

Congressional Add Details (\$ in Millions, and Includes General Reductions)

Project: 646003: *Partnership Intermediary Agreement(s)*

Congressional Add: *Program Increase - technology partnerships*

Congressional Add Subtotals for Project: 646003

Congressional Add Totals for all Projects

| | FY 2018 | FY 2019 |
|---|----------------|----------------|
| | 14.484 | 4.000 |
| Congressional Add Subtotals for Project: 646003 | 14.484 | 4.000 |
| Congressional Add Totals for all Projects | 14.484 | 4.000 |

Change Summary Explanation

Increase in FY 2020 for additional AFWERX virtual collaboration tools/analytics, innovation hub support, and civilian manpower.

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|---|--------------------|----------------|----------------|---------------------|--|----------------------|----------------|----------------|---|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 4 | | | | | R-1 Program Element (Number/Name) PE 0604317F / <i>Technology Transfer</i> | | | | Project (Number/Name) 646003 / <i>Partnership Intermediary Agreement(s)</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 646003: <i>Partnership Intermediary Agreement(s)</i> | - | 17.644 | 6.999 | 3.096 | 0.000 | 3.096 | 3.146 | 3.213 | 3.271 | 3.330 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

This project accomplishes the following: (1) establish license agreements to transfer patented inventions from Department of Defense (DoD) research laboratories to industry for conversion into new dual-use products and services to support DoD's defense mission and benefit the US economy; and (2) establish collaborative research and development agreements (CRADAs) with the private-sector for development of new, innovative, dual-use technology. Both of these activities enable DoD to leverage the investment and capabilities of the private-sector in development of new defense-related products and services, lowering DoD costs and also helping ensure that DoD-developed or co-developed technologies are transitioned to DoD operational use.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| Title: Technology Transfer | 3.160 | 2.999 | 3.096 |
| Description: Enhance and expand transfer of technologies between DoD and the commercial sector. | | | |
| FY 2019 Plans: Continue to implement cost effective approaches to increase and accelerate transfer of technologies developed at DoD laboratories and facilitate their transition to the warfighter. Evaluate and market DoD laboratory inventions and broker technology transfer agreements/CRADAs, to include commercial licenses, that will support the US defense mission and benefit the US economy. Engage the innovative capabilities of non-traditional defense contractors in developing and commercializing new dual-use products and services. | | | |
| FY 2020 Plans: Continue to implement new cost-effective approaches to further increase and accelerate transfer of technologies developed at DoD laboratories and facilitate their transition to the warfighter. Evaluate and market DoD laboratory inventions and broker technology transfer agreements/CRADAs, to include commercial licenses, that will support the US defense mission and benefit the US economy. Engage the innovative capabilities of non-traditional defense contractors in developing and commercializing new dual-use products and services. | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 increased compared to FY 2019 by \$0.097 million. Justification for the increase is described in the plans above. | | | |
| Accomplishments/Planned Programs Subtotals | 3.160 | 2.999 | 3.096 |

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force **Date:** February 2019

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|--|--|---|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604317F / <i>Technology Transfer</i> | Project (Number/Name) 646003 / <i>Partnership Intermediary Agreement(s)</i> |
|--|--|---|

| | FY 2018 | FY 2019 |
|---|---------|---------|
| Congressional Add: Program Increase - technology partnerships | 14.484 | 4.000 |
| FY 2018 Accomplishments: Conducted Congressionally directed efforts. | | |
| FY 2019 Plans: Conduct Congressionally directed efforts. | | |
| Congressional Adds Subtotals | 14.484 | 4.000 |

C. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

N/A

D. Acquisition Strategy

This effort uses a Partnership Intermediary Agreement (PIA) with TechLink at Montana State University. Through this agreement TechLink helps the Department of Defense to establish licensing and other technology transfer agreements with US industry. The effort is run through the Air Force Research Laboratory/Small Business office at Wright Patterson Air Force Base.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604317F / <i>Technology Transfer</i> | Project (Number/Name) 646003 / <i>Partnership Intermediary Agreement(s)</i> |

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
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| <i>Partnership Intermediary</i> | |
| Tech Transfer Partnership Intermediary | |
| Congressional Add | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604317F / <i>Technology Transfer</i> | Project (Number/Name) 646003 / <i>Partnership Intermediary Agreement(s)</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Partnership Intermediary</i> | | | | |
| Tech Transfer Partnership Intermediary | 1 | 2018 | 4 | 2024 |
| Congressional Add | 1 | 2018 | 4 | 2019 |

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|---|--------------------|----------------|----------------|---------------------|--|----------------------|----------------|----------------|--|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 4 | | | | | R-1 Program Element (Number/Name) PE 0604317F / <i>Technology Transfer</i> | | | | Project (Number/Name) 646030 / <i>AFwerX</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 646030: <i>AFwerX</i> | - | 0.000 | 9.925 | 20.518 | 0.000 | 20.518 | 10.516 | 10.519 | 10.521 | 10.700 | 0.000 | 72.699 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

This project improves Air Force capabilities by connecting innovators, simplifying technology transfer, and accelerating results. AFWERX will accomplish this mission by: (1) Connecting diverse, innovative members from industry, academia, and government; (2) Creating capabilities options and prototype opportunities for the Air Force; (3) Facilitating streamlined acquisition processes; and (4) Fostering a culture of innovation in the Air Force.

In FY 2019, Project 646030, AFWERX, was created under PE 0604317F, Technology Transfer, to provide centralized funding for AFWERX activities. This is an administrative alignment and not a new start. AFWERX was previously funded in FY 2017 and FY 2018 with execution year funding from various Air Force Science and Technology (S&T) RDT&E program elements.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| Title: AFWERX | 0.000 | 9.925 | 19.925 |
| Description: Connect diverse, innovative members from industry, academia, and government to create capabilities options and prototype opportunities for the Air Force. | | | |
| FY 2019 Plans: Continue to utilize the District of Columbia (DC), Las Vegas, and Austin Innovation Hubs to host events, implement new innovative competitions, collaborate with academia and think tanks, and work with industry through technology accelerator programs. | | | |
| FY 2020 Plans: Host additional innovative competitions to support warfighter needs at the DC, Las Vegas, and Austin Innovation hubs. Increase collaboration with government innovative centers, academia, thinks tanks, and industry through technology accelerator programs. Utilize additional virtual collaboration tools and analytics. Additional AFWEX Innovation Hub locations may be added as directed by Air Force Senior Leadership. | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 increased compared to FY 2019 by \$10.000 million. Funding increased due to additional investments in virtual collaboration tools/analytics and innovation competitions/projects. | | | |
| Title: AFWERX Acquisition Support | 0.000 | 0.000 | 0.593 |
| Description: Provide professional government civilian workforce in support of AFWERX programs and activities. | | | |
| FY 2019 Plans: | | | |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604317F / <i>Technology Transfer</i> | Project (Number/Name) 646030 / <i>AFwerX</i> |
|--|--|--|

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|---------|---------|---------|
| <p>In FY 2019 and prior, this effort is funded by the Air Force Research Laboratory (AFRL) with Air Force Science and Technology (S&T) RDT&E funding.</p> <p><i>FY 2020 Plans:</i> Continue to provide professional government civilian workforce in support of all AFWERX programs and activities. This includes three government civilians with average work year costs of \$0.197 million.</p> <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> FY 2020 increased compared to FY 2019 by \$0.593 million. Funding increased due to realignment of AFWERX manpower costs from AFRL to the AFWERX program.</p> | | | |
| Accomplishments/Planned Programs Subtotals | 0.000 | 9.925 | 20.518 |

C. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

D. Acquisition Strategy

The District of Columbia (DC) Innovation Hub and the Las Vegas Innovation Hub are contracted under existing Air Force Research Laboratory (AFRL) Partnership Intermediary Agreements (PIAs) which have already been awarded. The DC Innovation Hub is under a PIA with Virginia Tech Applied Research Corporation and the Vegas Innovation Hub is under a PIA with DefenseWerx.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604317F / <i>Technology Transfer</i> | Project (Number/Name) 646030 / <i>AFwerX</i> |
|--|--|--|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Las Vegas Innovation Hub | PO | DefenseWerx : Ft Walton Beach, FL | - | 0.000 | | 4.900 | Jan 2019 | 8.300 | Jan 2020 | - | | 8.300 | Continuing | Continuing | - |
| District of Columbia (DC) Innovation Hub | PO | VA Tech Applied Res Corp : Arlington, VA | - | 0.000 | | 4.750 | Jan 2019 | 5.525 | Jan 2020 | - | | 5.525 | Continuing | Continuing | - |
| Austin Innovation Hub | MIPR | Capital-Factory : Austin, TX | - | 0.000 | | 0.275 | Jan 2019 | 0.500 | Jan 2020 | - | | 0.500 | Continuing | Continuing | - |
| Product Development and Tools | TBD | All AFWERX locations : TBD | - | 0.000 | | 0.000 | | 5.600 | Jan 2020 | - | | 5.600 | Continuing | Continuing | - |
| Subtotal | | | - | 0.000 | | 9.925 | | 19.925 | | - | | 19.925 | Continuing | Continuing | N/A |

Remarks

The DC Innovation Hub stood up in FY 2017. The Las Vegas Innovation Hub opened in January 2018. The Austin Innovation Hub stood up in June 2018. Operating costs for these innovation hubs are funded in FY 2017 and FY 2018 with execution year funding from various Air Force Science and Technology (S&T) RDT&E program elements.

Additional innovation hubs may be opened in FY 2019 and/or FY 2020 as directed.

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Acquisition workforce | Allot | HQ Air Force : Arlington, VA | - | 0.000 | | 0.000 | | 0.593 | Oct 2019 | - | | 0.593 | Continuing | Continuing | - |
| Subtotal | | | - | 0.000 | | 0.000 | | 0.593 | | - | | 0.593 | Continuing | Continuing | N/A |

Remarks

Includes manpower costs for three government civilians. Prior to FY 2020 these manpower costs were funded with various Air Force S&T RDT&E program elements.

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|
| Project Cost Totals | - | 0.000 | 9.925 | 20.518 | - | 20.518 | Continuing | Continuing | N/A |

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604317F / <i>Technology Transfer</i> | Project (Number/Name) 646030 / <i>AFwerX</i> |
|--|--|--|

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

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| <i>AFwerX</i> | |
| <i>AFwerX</i> | |

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force **Date:** February 2019

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|--|--|--|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604317F / <i>Technology Transfer</i> | Project (Number/Name) 646030 / <i>AFwerX</i> |
|--|--|--|

Schedule Details

| Events by Sub Project | Start | | End | |
|-----------------------|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>AFwerX</i> | | | | |
| AFwerX | 1 | 2019 | 4 | 2024 |

Note
 The DC Innovation Hub stood up in FY 2017. The Las Vegas Innovation Hub opened in January 2018. The Austin Innovation opened in June 2018. Operating costs for these innovation hubs are funded in FY 2017 and FY 2018 with execution year funding from various Air Force Science and Technology (S&T) RDT&E program elements.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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|--|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0604327F I <i>Hard and Deeply Buried Target Defeat System (HDBTDS) Program</i> |
|--|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | 0.000 | 39.682 | 36.701 | 113.121 | 0.000 | 113.121 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 189.504 |
| 645341: <i>Direct Strike Penetrator Systems</i> | 0.000 | 39.682 | 36.701 | 113.121 | 0.000 | 113.121 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 189.504 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | - | - |

A. Mission Description and Budget Item Justification

The Direct Strike Penetrator Systems program develops and modifies a family of advanced precision-guided penetrator munitions to include development/integration of advanced position, navigation, and timing (PNT) capabilities (i.e., Global Positioning System (GPS), non-GPS, optical, passive, active, etc.) and smart fuze systems, and all penetrator components, that will provide the Air Force with improved ability to attack Hard and Deeply Buried Targets (HDBT), such as bunker and tunnel facilities, using air-to-surface conventional munitions. Systems developed include, but are not limited to MOP, A2K, A5K, and Section 804 Rapid Prototype/Rapid Fielding activities. Systems developed will be integrated onto current and future platforms to reduce the number of weapons required to hold HDBTs at risk and will result in more targets engaged per mission flown. Direct Strike Penetrators will provide critical global strike capability not met by inventory conventional weapons and will hold at risk the best protected high value assets essential to an enemy's war fighting ability. The project also provides an opportunity to quickly insert emerging technologies into existing and developing aircraft munitions and fuzes.

A Hard Target Munitions (HTM) Analysis-of-Alternatives (AoA) was conducted to determine the best weapons and/or development efforts for addressing the HDBT mission area. The HTM AoA determined that it was necessary to develop a family of HTMs in order to apply effects to the entire range of HDBT sets. The Air Force is using the AoA to develop, produce and modify HDBT weapons identified as the most effective and affordable. Modeling and simulation is used to assess and characterize current inventory and, to drive design and explore the utility of new classes of penetrator munitions.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver MOP, A2K, A5K, and M-Code weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, 0605898F, and 0605833F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|--|
| Appropriation/Budget Activity 3600: Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P) | R-1 Program Element (Number/Name) PE 0604327F I Hard and Deeply Buried Target Defeat System (HDBTDS) Program |
|---|--|

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 17.365 | 71.501 | 4.121 | 0.000 | 4.121 |
| Current President's Budget | 39.682 | 36.701 | 113.121 | 0.000 | 113.121 |
| Total Adjustments | 22.317 | -34.800 | 109.000 | 0.000 | 109.000 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | -3.300 | -1.800 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | -33.000 | | | |
| • Reprogrammings | 25.900 | 0.000 | | | |
| • SBIR/STTR Transfer | -0.283 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 109.000 | 0.000 | 109.000 |

Change Summary Explanation

FY 2018 funds reduced by \$3.300M for Congressional Directed Reduction of excess to need for Advanced 5000lb Penetrator and \$0.283M for Small Business Innovation Research. FY 2018 funds increased by \$24.900M via Above Threshold Reprogramming for Massive Ordnance Penetrator (MOP) Modification and by \$1.000 via Below Threshold Reprogramming from AMRAAM, PE 0207163F.

FY 2019 funds reduced by \$33.000M for Congressional Directed Transfer to Integrated Avionics Planning and Development, PE 0604201F and \$1.800 for Congressional Directed Reductions for program excess.

FY 2020 request increased by \$109.000M to support program requirements for MOP Modification and Advanced 5000lb Penetrator.

C. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| Title: Massive Ordnance Penetrator (MOP) Modification | 24.900 | 0.000 | 77.000 | 0.000 | 77.000 |
| Description: Modify the Massive Ordnance Penetrator (MOP) weapon for enhanced capability to hold additional Hard and Deeply Buried Targets at risk in multiple Combatant Commands (COCOMs). The modification will be primarily software-based and the existing inventory of Guided Bomb Unit (GBU)-57E/B will be retrofitted. Construct relevant hard and deeply buried targets for testing. Execute MOP testing in support of modification efforts to included sub-scale and full-scale ground and flight tests. Analyze MOP weapon effectiveness. | | | | | |
| FY 2019 Plans: Modification of weapon, target construction, and testing of the MOP Modification for enhanced capability. | | | | | |
| FY 2020 Base Plans: | | | | | |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|--|
| Appropriation/Budget Activity 3600: Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P) | R-1 Program Element (Number/Name) PE 0604327F I Hard and Deeply Buried Target Defeat System (HDBTDS) Program |
|---|--|

C. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|---------|---------|--------------|-------------|---------------|
| Continue testing and integration of MOP Modification for enhanced capability. Evaluate and analyze designs and prototype concepts for expanded aircraft employment. FY 2020 OCO Plans: N/A FY 2019 to FY 2020 Increase/Decrease Statement: Funding increased due to testing and integration of MOP Modification for enhanced capability. | | | | | |
| Title: Massive Ordnance Penetrator (MOP) Description: Integrate MOP weapon modifications onto the B-2. Design, prototype, modify and test concept penetrator and fuzing systems for expanded aircraft employment. Construct relevant hard and deeply buried targets for testing. Execute MOP testing in support of development efforts. Analyze MOP weapon effectiveness. FY 2019 Plans: N/A FY 2020 Base Plans: N/A FY 2020 OCO Plans: N/A FY 2019 to FY 2020 Increase/Decrease Statement: N/A | 0.785 | 0.000 | 0.000 | 0.000 | 0.000 |
| Title: Advanced 5,000 lb (A5K) Penetrator Description: Advanced 5,000 lb (A5K) Penetrator is an improved 5,000 lb class penetrator to address capability gaps identified in the HTM AoA. Conduct A5K design, development, integration, modeling and simulation, and testing to improve performance against increasingly hardened targets. This effort will utilize existing and improved technologies to field an integrated penetrator weapon system to include: an improved penetrator warhead, a smart fuze system that can detect layers/voids, and a modified Joint Direct Attack Munition (JDAM) tail kit for all weather, precision guidance, navigation, and control. FY 2019 Plans: | 12.997 | 32.701 | 33.970 | 0.000 | 33.970 |

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|--|--------|--|----------------------------|-------|---------|
| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P) | | R-1 Program Element (Number/Name) PE 0604327F I Hard and Deeply Buried Target Defeat System (HDBTDS) Program | | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | | | | |
| | | | | | |
| Continue A5K prototype design and development through modeling and simulation, initiate prototype production, conduct integration, testing and qualification of the A5K weapons system to verify system performance against the prioritized HTM AoA target set. | | | | | |
| FY 2020 Base Plans: Finalize A5K prototype design and complete full scale sled testing. Continue prototype production, integration and qualification testing, and conduct flight testing against operationally representative targets to verify system performance against the prioritized HTM AoA target set. | | | | | |
| FY 2020 OCO Plans: N/A | | | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: Funding increased due to A5K test activities. | | | | | |
| Title: Military Code (M-Code) and Enhanced Anti-Jam (EAJ) | | | | | |
| Description: M-Code and EAJ provides the capability to operate in increasing adversarial anti-access/area denial (A2/AD) jamming environments. M-Code and EAJ also provide increased accuracy, better signal acquisition, and advanced security. | | | | | |
| FY 2019 Plans: Develop and integrate M-Code receivers across the Air Force Program Executive Officer (AFPEO) weapons portfolio. | | | | | |
| FY 2020 Base Plans: Begin integration of M-Code into MOP weapon system. | | | | | |
| FY 2020 OCO Plans: N/A | | | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: Funding decreased due to integration of M-Code into MOP beginning in FY20. | | | | | |
| Accomplishments/Planned Programs Subtotals | | | | | |
| | 1.000 | 4.000 | 2.151 | 0.000 | 2.151 |
| | 39.682 | 36.701 | 113.121 | 0.000 | 113.121 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|--|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0604327F I <i>Hard and Deeply Buried Target Defeat System (HDBTDS) Program</i> |
|--|---|

D. Other Program Funding Summary (\$ in Millions)

| Line Item | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|--|---------|---------|-----------------|----------------|------------------|---------|---------|---------|---------|---------------------|------------|
| • PAAF 01 Line Item 353190: <i>WRM-Ammunition (MOP)</i> | 38.382 | 38.111 | 0.000 | - | 0.000 | 0.000 | 0.000 | - | - | Continuing | Continuing |
| • RDTE 04 PE 0604201F: <i>Integrated Avionics Planning & Development</i> | 58.288 | 81.271 | 92.600 | - | 92.600 | 0.000 | 0.000 | - | - | Continuing | Continuing |

Remarks

In FY 2018, PE 0604602F, Armament/Ordnance Development, Project 653134, BLU-109 and BLU-113 Upgrade efforts were transferred to PE 0604327F, Hard and Deeply Buried Target Defeat System (HDBTDS) Program, Project 645341, Direct Strike Penetrator Systems, in order to consolidate hard target munitions in one program element.

E. Acquisition Strategy

MOP uses sole source cost type contracts to complete development, test, and evaluation activities.

M-Code/EAJ effort uses a Family of Systems approach where the three prime weapons contractors develop receivers capable of operating in any of their AF weapons. The receivers are based on a common, internally-developed interface requirements specification, technology requirement document, and threat scenario. This approach uses a combination of contract types based on acquisition phase (Technology Maturation and Risk Reduction, Development, Production) and risk. The Weapons System Program Offices share a common development PE to allow flexibility in funding and planning, switching to individual PEs for receiver integration, operational test, and production. The M-Code/EAJ Weapons Receiver Development effort leverages technology currently under development by the GPS-Directorate Military GPS User Equipment program and will provide the warfighter with unmatched capability to operate in future A2/AD environments.

The initial A5K design was accomplished through modeling, simulation, and analysis producing potential designs. The designs were developed based on the performance parameters of survivability, lethality, accuracy and penetration. Upon completion of the modeling, simulation, and analysis of the A5K prototype designs a government review will determine the optimum A5K design going forward. That design will be used to fabricate test articles to include warheads, fuzing, and modified JDAM tail kits. These assets will be used to conduct and successfully complete qualification testing.

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604327F / <i>Hard and Deeply Buried Target Defeat System (HDBTDS) Program</i> | Project (Number/Name) 645341 / <i>Direct Strike Penetrator Systems</i> |
|--|---|--|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| MOP Modification and Integration | SS/ Various | Boeing : St Louis, MO | 0.000 | 8.000 | Mar 2019 | - | | 28.000 | Mar 2020 | - | | 28.000 | 0.000 | 36.000 | - |
| MOP HTM Weapons Effects/Target Analysis | MIPR | DTRA : Albuquerque, NM | 0.000 | 0.785 | Sep 2018 | - | | - | | - | | - | 0.000 | 0.785 | - |
| M-Code/EAJ Receiver | SS/CPAF | Various : TBD | 0.000 | 1.000 | Feb 2019 | 4.000 | Mar 2019 | - | | - | | - | 0.000 | 5.000 | - |
| MOP M-Code Integration | Various | Boeing : St Louis, MO | 0.000 | - | | - | | 2.151 | Jun 2020 | - | | 2.151 | 0.000 | 2.151 | - |
| A5K Warhead Design/ Components & Cases | MIPR | DOTC/ARA : Albuquerque, NM | 0.000 | 3.491 | May 2018 | 5.470 | Jan 2019 | 2.480 | Oct 2019 | - | | 2.480 | 0.000 | 11.441 | - |
| A5K Guidance (JDAM) | SS/ Various | Boeing Tech Services : St. Louis, MO | 0.000 | 4.014 | May 2018 | 9.710 | Apr 2019 | 3.840 | Dec 2019 | - | | 3.840 | 0.000 | 17.564 | - |
| A5K Embedded Fuze | MIPR | DOTC/ARA/NGIS : Albuquerque, NM | 0.000 | 0.892 | Aug 2018 | 7.019 | Jan 2019 | 4.652 | Oct 2019 | - | | 4.652 | 0.000 | 12.563 | - |
| Subtotal | | | 0.000 | 18.182 | | 26.199 | | 41.123 | | - | | 41.123 | 0.000 | 85.504 | N/A |

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|-----------------------------------|------------------------|---------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| MOP Govt Support | Various | Various : Eglin AFB, FL | 0.000 | 0.351 | Dec 2018 | - | | 1.000 | Feb 2020 | - | | 1.000 | 0.000 | 1.351 | - |
| A5K System T&E Contractor Support | MIPR | DOTC/ARA/NGIS : Albuquerque, NM | 0.000 | - | | 2.734 | Jan 2019 | 4.316 | Oct 2019 | - | | 4.316 | 0.000 | 7.050 | - |
| A5K System T&E Government Support | MIPR | MCAAP : McAlister, OK | 0.000 | 0.321 | Aug 2018 | 1.217 | Apr 2019 | 0.622 | May 2020 | - | | 0.622 | 0.000 | 2.160 | - |
| Subtotal | | | 0.000 | 0.672 | | 3.951 | | 5.938 | | - | | 5.938 | 0.000 | 10.561 | N/A |

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|--|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604327F / <i>Hard and Deeply Buried Target Defeat System (HDBTDS) Program</i> | Project (Number/Name) 645341 / <i>Direct Strike Penetrator Systems</i> |
|--|---|--|

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| MOP Test & Evaluation | Various | AFLCMC : Eglin, Holloman, Edw, FL | 0.000 | 6.590 | Feb 2019 | - | | 8.000 | Jan 2020 | - | | 8.000 | 0.000 | 14.590 | - |
| MOP Target Construction and Instrumentation | Various | DTRA : Albuquerque, NM | 0.000 | 8.120 | Dec 2018 | - | | 36.000 | Nov 2019 | - | | 36.000 | 0.000 | 44.120 | - |
| A5K Developmental Test & Evaluation | Various | 96 TW, 780 TS : Eglin, Holloman, FL | 0.000 | 3.042 | May 2018 | 4.153 | Jul 2019 | 10.493 | Apr 2020 | - | | 10.493 | 0.000 | 17.688 | - |
| A5K Operational Test & Evaluation | Various | 96 TW, Det 1, DTRA : Eglin, WSMR, FL | 0.000 | 0.407 | Jul 2018 | 2.298 | Mar 2019 | 6.387 | Oct 2019 | - | | 6.387 | 0.000 | 9.092 | - |
| Subtotal | | | 0.000 | 18.159 | | 6.451 | | 60.880 | | - | | 60.880 | 0.000 | 85.490 | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| MOP Program Management Administration (PMA) | Various | AFLCMC/EBD : Eglin AFB, FL | 0.000 | 1.839 | May 2019 | - | | 4.000 | May 2020 | - | | 4.000 | 0.000 | 5.839 | - |
| A5K Program Management Administration (PMA) | Various | AFLCMC/EBD : Eglin AFB, FL | 0.000 | 0.830 | May 2018 | 0.100 | Jan 2019 | 1.180 | Jan 2020 | - | | 1.180 | 0.000 | 2.110 | - |
| Subtotal | | | 0.000 | 2.669 | | 0.100 | | 5.180 | | - | | 5.180 | 0.000 | 7.949 | N/A |

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract | |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|-----|
| Project Cost Totals | | 0.000 | 39.682 | 36.701 | 113.121 | - | 113.121 | 0.000 | 189.504 | N/A |

Remarks

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| | | |
|---|---|--|
| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604327F / <i>Hard and Deeply Buried Target Defeat System (HDBTDS) Program</i> | Project (Number/Name) 645341 / <i>Direct Strike Penetrator Systems</i> |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| Direct Strike Penetrator Systems | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MOP Modification Analysis and Testing | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MOP M-Code Integration | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A5K Design, Development and Testing | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| M-Code/EAJ Development/Integration | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604327F / <i>Hard and Deeply Buried Target Defeat System (HDBTDS) Program</i> | Project (Number/Name) 645341 / <i>Direct Strike Penetrator Systems</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Direct Strike Penetrator Systems</i> | | | | |
| MOP Modification Analysis and Testing | 1 | 2019 | 4 | 2022 |
| MOP M-Code Integration | 3 | 2020 | 4 | 2022 |
| A5K Design, Development and Testing | 2 | 2018 | 4 | 2021 |
| M-Code/EAJ Development/Integration | 1 | 2018 | 2 | 2021 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0604414F / <i>Cyber Resiliency of Weapon Systems-ACS</i> |
|--|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|--|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 41.055 | 62.618 | 56.325 | 0.000 | 56.325 | 74.535 | 82.947 | 81.488 | 76.597 | Continuing | Continuing |
| 642810: <i>Cyber Workforce Development</i> | - | 6.550 | 17.462 | 8.200 | 0.000 | 8.200 | 8.400 | 8.650 | 8.451 | 8.434 | Continuing | Continuing |
| 642812: <i>System Security Engineering</i> | - | 7.411 | 13.059 | 17.001 | 0.000 | 17.001 | 17.072 | 19.378 | 19.474 | 17.379 | Continuing | Continuing |
| 642816: <i>Agile/Adaptable Standards</i> | - | 5.214 | 4.992 | 7.250 | 0.000 | 7.250 | 8.500 | 9.750 | 9.144 | 9.130 | Continuing | Continuing |
| 642834: <i>Mission Assurance for Fielded Systems</i> | - | 18.080 | 20.925 | 17.036 | 0.000 | 17.036 | 33.654 | 37.584 | 36.969 | 34.650 | Continuing | Continuing |
| 642836: <i>Mission Threat Analysis</i> | - | 3.800 | 6.180 | 6.838 | 0.000 | 6.838 | 6.909 | 7.585 | 7.450 | 7.004 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

This program funds activities at the Cyber Resiliency Office for Weapon Systems (CROWS), which is based at Hanscom Air Force Base, MA and provides acquisition cyber support to the Air Force Lifecycle Management Center, Air Force Test Center, Air Force Nuclear Warfare Center, Space and Missile System Center, and Air Force Operational Test and Evaluation Center. CROWS accomplishes two goals to increase weapon systems cyber resiliency/security in all phases of the acquisition life cycle. First, CROWS builds cyber resiliency into weapon systems by integrating cyber design tenets into the systems engineering process. Second, CROWS assesses and protects fielded systems from cyber exploitation.

To meet these goals, this program addresses cyber resiliency and security gaps in five projects. The first project targets the workforce by increasing cyber security and resiliency skills, knowledge, and experience of acquisitions personnel. The second project targets system security engineering activities by prototyping, evaluating, and transitioning cyber secure and resilient risk-informed processes, tools, products, and policies into all phases of the acquisition life cycle. The third project develops standards for designing new weapon systems by defining a government reference architecture, affords weapon system designers the opportunity to use open system architectures, and provides the capability to rapidly update weapon systems cyber components in response to new cyber threats. The fourth project performs bottom-up cyber assessments on individual Air Force weapons systems, addressing the Fiscal Year 2016 National Defense Authorization Act (Section 1647) mandate as well as designing mitigation strategies and prototyping solutions for known cross-platform vulnerabilities. The final project uses a top-down approach to evaluate mission sets of Air Force weapons systems and addresses gaps in mission assurance due to evolving cyber threats.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver CROWS capabilities. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, 0605833F, and 0605898F.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|--|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0604414F / <i>Cyber Resiliency of Weapon Systems-ACS</i> |
|--|---|

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 32.253 | 62.618 | 60.667 | 0.000 | 60.667 |
| Current President's Budget | 41.055 | 62.618 | 56.325 | 0.000 | 56.325 |
| Total Adjustments | 8.802 | 0.000 | -4.342 | 0.000 | -4.342 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 10.200 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -1.398 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | -4.342 | 0.000 | -4.342 |

Congressional Add Details (\$ in Millions, and Includes General Reductions)

Project: 642834: *Mission Assurance for Fielded Systems*

Congressional Add: *Program increase - cybersecurity and resiliency for weapon systems*

Congressional Add Subtotals for Project: 642834

Congressional Add Totals for all Projects

| | FY 2018 | FY 2019 |
|--|----------------|----------------|
| | 9.864 | 0.000 |
| | 9.864 | 0.000 |
| | 9.864 | 0.000 |

Change Summary Explanation

The FY 2020 funding request was reduced by \$4.342 million to account for availability of prior year balances.

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|---|--------------------|----------------|----------------|---------------------|---|----------------------|----------------|----------------|---|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 4 | | | | | R-1 Program Element (Number/Name) PE 0604414F / <i>Cyber Resiliency of Weapon Systems-ACS</i> | | | | Project (Number/Name) 642810 / <i>Cyber Workforce Development</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 642810: <i>Cyber Workforce Development</i> | - | 6.550 | 17.462 | 8.200 | 0.000 | 8.200 | 8.400 | 8.650 | 8.451 | 8.434 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

The Cyber Workforce Development project develops and transitions cyber resiliency training, manning strategies, and deploys teams providing cyber acquisition experts to Program Executive Offices (PEO) to address acquisition workforce gaps in cyber resiliency/security manpower, experience, and knowledge. This project hones workforce expertise and skills required to counter weapon system-unique cyber threats, which exceeds the knowledge needed to secure Internet Protocol (IP) based systems against traditional network-based cyber threats. Such expertise is critical for acquisition professionals to ensure cyber resiliency/security design tenets are integrated into the weapon system life cycle.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| Title: Increase Acquisition Workforce Cyber Expertise | 6.550 | 17.462 | 8.200 |
| Description: Increases knowledge and advanced skills of acquisition workforce. | | | |
| FY 2019 Plans: Complete on-board training and initial stand-up of the Cyber Resiliency Support Team (CRST) to centrally manage training, tools, and best practices for the field Cyber Focus Teams (CFTs). Hire initial CFT personnel and deploy them to eight geographically separated PEO to integrate cyber resiliency tenets into Air Force acquisition programs. Continue development and fielding of cyber training, establish an Air Force weapons system cyber training curriculum, and establish cross-service training, collaboration and standardization. Continue cyber personnel hiring/retention strategies. | | | |
| FY 2020 Plans: Continue to compile threat, weapon system and technology gaps and integrate this information into the Air Force weapon system cyber resiliency training curriculum to reduce enterprise risk. Identify cyber security/resiliency skill gaps in the functional areas of the acquisition workforce. Continue to expand and improve/validate CFT proof-of-concept based on PEO feedback. Execute hiring and retention strategy for skilled weapon system cyber resiliency acquisition professionals. | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 decreased compared to FY 2019 by \$9.262 million. Funding decreased due to realignment of priorities to other projects within this program. | | | |
| Accomplishments/Planned Programs Subtotals | 6.550 | 17.462 | 8.200 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604414F / <i>Cyber Resiliency of Weapon Systems-ACS</i> | Project (Number/Name) 642810 / <i>Cyber Workforce Development</i> |

C. Other Program Funding Summary (\$ in Millions)
N/A

Remarks

D. Acquisition Strategy
When possible, activities in this effort will leverage current competitively-awarded contracts. Additional necessary contracts funded in this program element will be awarded using either competitive or sole source procedures, whichever is most appropriate.

E. Performance Metrics
Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|---|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604414F / <i>Cyber Resiliency of Weapon Systems-ACS</i> | Project (Number/Name) 642810 / <i>Cyber Workforce Development</i> |
|--|---|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Air Force Cyber Resiliency Training - Air Force Institute of Technology (AFRL) | Various | Various : Various | - | 1.106 | Apr 2018 | 8.424 | Feb 2019 | 2.100 | Nov 2019 | - | | 2.100 | Continuing | Continuing | - |
| Subtotal | | | - | 1.106 | | 8.424 | | 2.100 | | - | | 2.100 | Continuing | Continuing | N/A |

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Defense Technical Information Center (DTIC), MITRE | Various | Various : Various | - | 1.947 | Apr 2018 | 6.301 | Nov 2018 | 2.300 | Nov 2019 | - | | 2.300 | Continuing | Continuing | - |
| Subtotal | | | - | 1.947 | | 6.301 | | 2.300 | | - | | 2.300 | Continuing | Continuing | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| A&AS, Travel, Government Purchase Card | Various | Various : Various | - | 3.497 | Apr 2018 | 2.737 | Nov 2018 | 3.800 | Nov 2019 | - | | 3.800 | Continuing | Continuing | - |
| Subtotal | | | - | 3.497 | | 2.737 | | 3.800 | | - | | 3.800 | Continuing | Continuing | N/A |

| | | | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|--|--|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|
| Project Cost Totals | | | - | 6.550 | 17.462 | 8.200 | - | 8.200 | Continuing | Continuing | N/A |

Remarks

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|---|---|---|
| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604414F / <i>Cyber Resiliency of Weapon Systems-ACS</i> | Project (Number/Name) 642810 / <i>Cyber Workforce Development</i> |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|--|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| <i>Cyber Workforce Development</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Deploy Cyber Resiliency Support Team | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Deploy Cyber Focus Teams | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Develop basic weapon system cyber awareness training | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Develop advanced weapon system cyber training | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hire/retain cyber security professionals | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604414F / <i>Cyber Resiliency of Weapon Systems-ACS</i> | Project (Number/Name) 642810 / <i>Cyber Workforce Development</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Cyber Workforce Development</i> | | | | |
| Deploy Cyber Resiliency Support Team | 2 | 2018 | 4 | 2024 |
| Deploy Cyber Focus Teams | 3 | 2019 | 4 | 2024 |
| Develop basic weapon system cyber awareness training | 2 | 2018 | 4 | 2024 |
| Develop advanced weapon system cyber training | 2 | 2018 | 4 | 2024 |
| Hire/retain cyber security professionals | 2 | 2018 | 4 | 2024 |

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|---|--------------------|----------------|----------------|---------------------|---|----------------------|----------------|----------------|---|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 4 | | | | | R-1 Program Element (Number/Name) PE 0604414F / <i>Cyber Resiliency of Weapon Systems-ACS</i> | | | | Project (Number/Name) 642812 / <i>System Security Engineering</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 642812: <i>System Security Engineering</i> | - | 7.411 | 13.059 | 17.001 | 0.000 | 17.001 | 17.072 | 19.378 | 19.474 | 17.379 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

The System Security Engineering project prototypes, evaluates, and transitions cyber secure/resilient processes, tools, products, and policies into all activities of weapon systems acquisition. This activity bolsters Air Force cyber resiliency/security by developing common security environments for Program Offices to share information on classified weapon system cyber intelligence threats and vulnerabilities. The project develops Air Force and Department of Defense system security engineering processes, policies, and contracting language, and refines intelligence collection and processes to provide actionable information on cyber threats to the weapons system community. This activity supports Air Force Program Offices, the Cyber Resiliency Support Team, embedded Program Executive Office Cyber Focus Teams, the Protecting Critical Technologies Task Force, Defense Industrial Base data protection efforts, Air Force Supply Chain Risk Management, and other weapon system cyber security/resiliency activities as required.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| Title: Prototype, Evaluate, and Transition System Security Engineering | 7.411 | 13.059 | 17.001 |
| Description: Prototypes, evaluates, and transitions cyber security and resiliency activities into policy, processes, products, and people. | | | |
| FY 2019 Plans: Continue prototyping a common cyber security environment for sharing of cyber information across Air Force weapon systems. Continue to refine and execute intelligence collection/analysis to identify cyber threats and cyber posture for specific weapon systems. Deliver next iteration of product prototypes, tools, policy and processes to integrate cyber resiliency/security in all phases and activities of weapon system acquisition. | | | |
| FY 2020 Plans: Continue prototyping a common cyber security environment for sharing of cyber information across Air Force weapon systems. Continue to refine and execute intelligence collection/analysis to identify cyber threats and cyber posture for specific weapon systems. Deliver next iteration of product prototypes, tools, policy and processes to integrate cyber resiliency/security in all phases and activities of weapons system acquisition. | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: | | | |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604414F / <i>Cyber Resiliency of Weapon Systems-ACS</i> | Project (Number/Name) 642812 / <i>System Security Engineering</i> |

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| FY 2020 increased compared to FY 2019 by \$3.942 million. Funding increased due to delivery of common secure environments and increased intelligence collection and analysis. | | | |
| Accomplishments/Planned Programs Subtotals | 7.411 | 13.059 | 17.001 |

C. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

D. Acquisition Strategy

When possible, activities in this effort will leverage current competitively-awarded contracts. Additional necessary contracts funded in this program element will be awarded using either competitive or sole source procedures, whichever is most appropriate.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|---|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604414F / <i>Cyber Resiliency of Weapon Systems-ACS</i> | Project (Number/Name) 642812 / <i>System Security Engineering</i> |
|--|---|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Common cyber security environments | Various | Various : Various | - | 2.539 | May 2018 | 6.686 | Jan 2019 | 8.671 | Dec 2019 | - | | 8.671 | Continuing | Continuing | - |
| Products, policy, and processes in the acquisition life cycle and sustainment process | Various | Various : Various | - | 1.155 | May 2018 | 1.524 | Jan 2019 | 1.286 | Dec 2019 | - | | 1.286 | Continuing | Continuing | - |
| Intel collection skills to identify cyber threats to weapon systems | Various | Various : Various | - | 1.521 | Jul 2018 | 2.706 | Jan 2019 | 3.474 | Dec 2019 | - | | 3.474 | Continuing | Continuing | - |
| Subtotal | | | - | 5.215 | | 10.916 | | 13.431 | | - | | 13.431 | Continuing | Continuing | N/A |

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Defense Technical Information Center (DTIC) | Various | Various : Various | - | 1.562 | May 2018 | 0.498 | Dec 2018 | 3.570 | Dec 2019 | - | | 3.570 | Continuing | Continuing | - |
| Subtotal | | | - | 1.562 | | 0.498 | | 3.570 | | - | | 3.570 | Continuing | Continuing | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| A&AS | Various | Various : TBD | - | 0.634 | May 2018 | 1.645 | Dec 2018 | 0.000 | | - | | 0.000 | Continuing | Continuing | - |
| Subtotal | | | - | 0.634 | | 1.645 | | 0.000 | | - | | 0.000 | Continuing | Continuing | N/A |

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract | |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|-----|
| Project Cost Totals | | - | 7.411 | 13.059 | 17.001 | - | 17.001 | Continuing | Continuing | N/A |

Remarks

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604414F / <i>Cyber Resiliency of Weapon Systems-ACS</i> | Project (Number/Name) 642812 / <i>System Security Engineering</i> |

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
|---|------------|
| System Security Engineering | |
| Prototype and deliver common cyber security environments | [REDACTED] |
| Prototype and deliver enhanced system security engineering processes and products | [REDACTED] |
| Prototype and deliver cyber security design and contractual requirements | [REDACTED] |
| Prototype and deliver acquisition cyber intel analysis products and techniques | [REDACTED] |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604414F / <i>Cyber Resiliency of Weapon Systems-ACS</i> | Project (Number/Name) 642812 / <i>System Security Engineering</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|---|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>System Security Engineering</i> | | | | |
| Prototype and deliver common cyber security environments | 2 | 2018 | 4 | 2024 |
| Prototype and deliver enhanced system security engineering processes and products | 2 | 2019 | 4 | 2024 |
| Prototype and deliver cyber security design and contractual requirements | 2 | 2018 | 4 | 2022 |
| Prototype and deliver acquisition cyber intel analysis products and techniques | 2 | 2018 | 4 | 2024 |

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|---|--------------------|----------------|----------------|---------------------|---|----------------------|----------------|----------------|---|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 4 | | | | | R-1 Program Element (Number/Name) PE 0604414F / <i>Cyber Resiliency of Weapon Systems-ACS</i> | | | | Project (Number/Name) 642816 / <i>Agile/Adaptable Standards</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 642816: <i>Agile/Adaptable Standards</i> | - | 5.214 | 4.992 | 7.250 | 0.000 | 7.250 | 8.500 | 9.750 | 9.144 | 9.130 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

The Agile/Adaptable Standards project develops and prototypes adaptable Government Reference Architectures (GRA) using open standards. Systems designed with a GRA permit responsive hardware/software updates to adapt to new and evolving threats, incorporate advanced technologies, and mitigate component obsolescence. A pathfinder activity will focus on developing the next generation GRA for position, navigation and timing (PNT). This effort will provide weapon systems with a robust and resilient architecture capable of alternate navigation techniques beyond the current Global Positioning System/Inertial Navigation System (GPS/INS). The lessons learned from the PNT pathfinder will be used to develop the right policies, processes, and products for future open architectures and provide Program Offices with the capability to build agile and adaptable cyber-resilient systems.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| Title: Agile and Adaptable Standards | 5.214 | 4.992 | 7.250 |
| Description: Develop, prototype, evaluate, and transition agile and adaptable system standards for integration into Air Force weapon systems. | | | |
| FY 2019 Plans: Continue prototyping open system architecture components for use in PNT systems. Prototype techniques and methodologies to increase cyber security features of open standards. Prototype the use of alternative navigation techniques using software defined receivers. | | | |
| FY 2020 Plans: Continue open system architecture prototyping, integration and demonstration of components for use in advanced architectures (e.g. electronic warfare (EW), radar, PNT, etc.). Prototype and deliver techniques and methodologies to increase cyber security features of the advanced avionics GRA and open standards. Continue prototyping the use of alternative navigation techniques and software defined receivers. Start developing a composite GRA for an advanced architectures to include major subsystems like EW, radar, PNT, communications/datalink, and autonomous functions. | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 increased compared to FY 2019 by \$2.258 million. Funding increased due to increased Department of Defense emphasis on developing and transitioning open standards. | | | |
| Accomplishments/Planned Programs Subtotals | 5.214 | 4.992 | 7.250 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604414F / <i>Cyber Resiliency of Weapon Systems-ACS</i> | Project (Number/Name) 642816 / <i>Agile/Adaptable Standards</i> |

C. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

D. Acquisition Strategy

When possible, activities in this effort will leverage current competitively-awarded contracts. Additional necessary contracts funded in this program element will be awarded using either competitive or sole source procedures, whichever is most appropriate.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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|--|--|--|--|---|--|--|--|--|---|--|--|----------------------------|--|--|
| Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force | | | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 4 | | | | R-1 Program Element (Number/Name) PE 0604414F / <i>Cyber Resiliency of Weapon Systems-ACS</i> | | | | | Project (Number/Name) 642816 / <i>Agile/Adaptable Standards</i> | | | | | |

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | | | |
|---|------------------------------|-----------------------------------|----------------|---------|---------------|---------|---------------|-----------------|---------------|----------------|---------------|------------------|---------------------|---------------|--------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | Target Value of Contract |
| Prototype open system architecture components | Various | Various : Various | - | 4.190 | Jun 2018 | 4.012 | Jan 2019 | 5.826 | Jan 2020 | - | | 5.826 | Continuing | Continuing | - |
| Subtotal | | | - | 4.190 | | 4.012 | | 5.826 | | - | | 5.826 | Continuing | Continuing | N/A |

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | | | |
|---|------------------------------|-----------------------------------|----------------|---------|---------------|---------|---------------|-----------------|---------------|----------------|---------------|------------------|---------------------|---------------|--------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | Target Value of Contract |
| Air Force Research Laboratory (AFRL), Defense Technical Information Center (DTIC) | Various | Various : Various | - | 1.024 | Jun 2018 | 0.980 | Jan 2019 | 1.424 | Jan 2020 | - | | 1.424 | Continuing | Continuing | - |
| Subtotal | | | - | 1.024 | | 0.980 | | 1.424 | | - | | 1.424 | Continuing | Continuing | N/A |

| | | | Prior Years | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|--|--|----------------|---------|--|---------|--|-----------------|--|----------------|--|------------------|------------|---------------------|---------------|--------------------------------|
| Project Cost Totals | | | - | 5.214 | | 4.992 | | 7.250 | | - | | 7.250 | Continuing | Continuing | N/A | |

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force Date: February 2019

| | | |
|--|--|--|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604414F / Cyber Resiliency of Weapon Systems-ACS | Project (Number/Name) 642816 / Agile/Adaptable Standards |
|--|--|--|

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
|--|--|
| <i>Agile/Adaptable Standards</i> | |
| Develop and update open systems architecture processes | |
| Prototype open system architecture components | |
| Prototype and update open standards | |
| Conduct open systems architecture pathfinders | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604414F / <i>Cyber Resiliency of Weapon Systems-ACS</i> | Project (Number/Name) 642816 / <i>Agile/Adaptable Standards</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Agile/Adaptable Standards</i> | | | | |
| Develop and update open systems architecture processes | 3 | 2018 | 3 | 2022 |
| Prototype open system architecture components | 3 | 2018 | 3 | 2019 |
| Prototype and update open standards | 3 | 2018 | 4 | 2024 |
| Conduct open systems architecture pathfinders | 3 | 2018 | 4 | 2024 |

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|---|--------------------|----------------|----------------|---------------------|---|----------------------|----------------|----------------|---|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 4 | | | | | R-1 Program Element (Number/Name) PE 0604414F / <i>Cyber Resiliency of Weapon Systems-ACS</i> | | | | Project (Number/Name) 642834 / <i>Mission Assurance for Fielded Systems</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 642834: <i>Mission Assurance for Fielded Systems</i> | - | 18.080 | 20.925 | 17.036 | 0.000 | 17.036 | 33.654 | 37.584 | 36.969 | 34.650 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

The Mission Assurance for Fielded Systems project identifies and verifies weapon system cyber susceptibilities/vulnerabilities and determines the risk to the user, platform, and enterprise by correlating cross-platform impacts and risk to the mission. This effort also identifies mitigations to high risk cyber vulnerabilities and recommends a transition path for fielded weapon systems, subsystems, and support systems. Trusted System Network risk and programs' Supply Chain Risk Management may also be evaluated and addressed. Traditional cyber security focuses on Internet Protocol (IP) based system compliance with the Risk Management Framework (RMF), as described in National Institute of Standards and Technology (NIST) Special Publications 800-37 and 800-53. This project addresses the gaps between RMF compliance and the cyber resiliency efforts required for non IP-based fielded weapon systems, subsystems, and support systems. Activities in this project include: 1) the investigation of non-materiel mitigations, to include changes to Tactics, Techniques, and Procedures (TTPs), and 2) the investigation and prototyping of engineering materiel solutions to transfer to the Program Offices for development on their weapon systems, subsystems, and support systems.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| Title: Cyber Risk Assessments and Mitigation Prototyping | 8.216 | 20.925 | 17.036 |
| Description: Evaluate weapon systems and conduct cyber risk assessments to identify, validate, and prioritize cyber vulnerabilities/susceptibilities. Partner with system owners and acquisition Program Offices to develop prototype mitigations. | | | |
| FY 2019 Plans: Continue assessment of fielded weapon systems, subsystems, and support systems for cyber susceptibilities and vulnerabilities. Continue prototyping mitigations for cyber vulnerabilities on fielded weapon systems, subsystems and support systems in realistic, high fidelity environments. Identify of common cyber vulnerabilities on fielded weapons systems and partner with the system owner and acquisition program office to prototype multi-platform mitigation prototypes. | | | |
| FY 2020 Plans: Continue assessment of fielded weapon systems, subsystems, and support systems for cyber susceptibilities and vulnerabilities. Provide an up-to-date prioritized list of Air Force weapon system vulnerabilities. Provide a centralized data repository for weapon system cyber vulnerability mitigations. Continue prototyping mitigations for cyber vulnerabilities on fielded weapon systems, subsystems and support systems in realistic, high fidelity environments. Continue identification of cyber vulnerabilities on fielded weapons systems and partner with the system owner and acquisition program office to prototype mitigation prototypes. | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: | | | |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604414F / <i>Cyber Resiliency of Weapon Systems-ACS</i> | Project (Number/Name) 642834 / <i>Mission Assurance for Fielded Systems</i> |

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| FY 2020 decreased compared to FY 2019 by \$3.889 million. Funding decreased due to account for prior year balances. | | | |
| Accomplishments/Planned Programs Subtotals | 8.216 | 20.925 | 17.036 |

| | FY 2018 | FY 2019 |
|--|----------------|----------------|
| Congressional Add: Program increase - cybersecurity and resiliency for weapon systems | 9.864 | 0.000 |
| FY 2018 Accomplishments: Conducted Congressionally directed efforts | | |
| FY 2019 Plans: Not applicable | | |
| Congressional Adds Subtotals | 9.864 | 0.000 |

C. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

D. Acquisition Strategy

When possible, activities in this effort will leverage current competitively-awarded contracts. Additional necessary contracts funded in this program element will be awarded using either competitive or sole source procedures.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|---|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604414F / <i>Cyber Resiliency of Weapon Systems-ACS</i> | Project (Number/Name) 642834 / <i>Mission Assurance for Fielded Systems</i> |
|--|---|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Evaluate weapon systems for prototype cyber vulnerability mitigations | Various | Various : TBD | - | 0.000 | Jun 2018 | 17.425 | Jan 2019 | 17.036 | Jan 2020 | - | | 17.036 | Continuing | Continuing | - |
| Congressional Add - Cybersecurity and resiliency for weapon systems | Various | Various : TBD | - | 9.864 | Oct 2018 | - | | - | | - | | - | Continuing | Continuing | - |
| Subtotal | | | - | 9.864 | | 17.425 | | 17.036 | | - | | 17.036 | Continuing | Continuing | N/A |

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Air Force Research Laboratory (AFRL), Defense Technical Information Center (DTIC), MITRE | Various | Various : TBD | - | 7.730 | Jun 2018 | 3.500 | Jan 2019 | 0.000 | Jan 2020 | - | | 0.000 | Continuing | Continuing | - |
| Subtotal | | | - | 7.730 | | 3.500 | | 0.000 | | - | | 0.000 | Continuing | Continuing | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| A&AS | Various | Various : TBD | - | 0.486 | Jun 2018 | 0.000 | | 0.000 | | - | | 0.000 | Continuing | Continuing | - |
| Subtotal | | | - | 0.486 | | 0.000 | | 0.000 | | - | | 0.000 | Continuing | Continuing | N/A |

| | | | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|--|--|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|
| Project Cost Totals | | | - | 18.080 | 20.925 | 17.036 | - | 17.036 | Continuing | Continuing | N/A |

Remarks

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604414F / <i>Cyber Resiliency of Weapon Systems-ACS</i> | Project (Number/Name) 642834 / <i>Mission Assurance for Fielded Systems</i> |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|--|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| <i>Mission Assurance for Fielded Systems</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Prototype cyber mitigations on known cyber vulnerabilities | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Identify transition plan for tested mitigations to known cyber vulnerabilities | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Perform cyber assessment of weapon systems, subsystems, and support systems | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Verify and determine risk of cyber vulnerabilities found during weapon system assessments | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604414F / <i>Cyber Resiliency of Weapon Systems-ACS</i> | Project (Number/Name) 642834 / <i>Mission Assurance for Fielded Systems</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|---|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Mission Assurance for Fielded Systems</i> | | | | |
| Prototype cyber mitigations on known cyber vulnerabilities | 3 | 2018 | 4 | 2024 |
| Identify transition plan for tested mitigations to known cyber vulnerabilities | 3 | 2018 | 4 | 2024 |
| Perform cyber assessment of weapon systems, subsystems, and support systems | 3 | 2018 | 4 | 2024 |
| Verify and determine risk of cyber vulnerabilities found during weapon system assessments | 3 | 2018 | 4 | 2024 |

Note

Additional schedule details can be provided in the appropriate forum.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|---|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604414F / <i>Cyber Resiliency of Weapon Systems-ACS</i> | Project (Number/Name) 642836 / <i>Mission Thread Analysis</i> |
|--|---|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|--|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| 642836: <i>Mission Thread Analysis</i> | - | 3.800 | 6.180 | 6.838 | 0.000 | 6.838 | 6.909 | 7.585 | 7.450 | 7.004 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

The Cyber Mission Thread Analysis (CMTA) project establishes an common, repeatable, mission-level cyber analytical methodology to prioritize where the Air Force should perform detailed cyber investigations based on potential mission impact. Analysis results provide a System-of-Systems mission context to prioritize cyber vulnerability assessments and risk mitigation strategy development across the Air Force enterprise to improve mission assurance in a cyber-contested environment. Activities include investigating existing methodologies, prototyping an analytical process, prototyping software support tools, and institutionalizing CMTA in Air Force acquisition processes. Each CMTA will identify the mission functions performed, participating systems, and top level interactions among all relevant participants from the user's point of view. By understanding operational intent, mission dependencies, and the cyber risk landscape, experts in system development, operational support, and sustainment can make objective statements about mission impact and task outcomes as well as assess potential mitigations.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|---|---------|---------|---------|
| Title: Cyber Mission Thread Analysis | 3.800 | 6.180 | 6.838 |
| Description: Prototypes, evaluates, and transitions methodologies, tools, and equipment in support of cyber threat for mission threads analyses. | | | |
| FY 2019 Plans: Execute Cyber Mission Thread Analysis (CMTA) on Airlift and Theater Command and Control. Working with Mission Defense Teams exploring functional mission analysis and cyber mission thread analysis collaborative efforts. | | | |
| FY 2020 Plans: Develop Cyber Mission Thread Analysis (CMTA) Training. Evolve tools, mature and institutionalize the role of Cyber Mission Thread Analysis (CMTA). | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 increased compared to FY 2019 by \$0.658 million. Justification for this increase is described in the FY 2020 plans above. | | | |
| Accomplishments/Planned Programs Subtotals | 3.800 | 6.180 | 6.838 |

C. Other Program Funding Summary (\$ in Millions)

N/A

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|---|---|---|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604414F / <i>Cyber Resiliency of Weapon Systems-ACS</i> | Project (Number/Name) 642836 / <i>Mission Thread Analysis</i> |

C. Other Program Funding Summary (\$ in Millions)

Remarks

D. Acquisition Strategy

When possible, activities in this effort will leverage current competitively-awarded contracts. Additional necessary contracts funded in this program element will be awarded using either competitive or sole source procedures, whichever is most appropriate.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|---|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604414F / <i>Cyber Resiliency of Weapon Systems-ACS</i> | Project (Number/Name) 642836 / <i>Mission Threat Analysis</i> |
|--|---|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Air Force Research Laboratory (AFRL), Automatic Thread Generation, Mission Threat Analysis Tools | Various | Various : Various | - | 2.200 | Apr 2018 | 4.380 | Jan 2019 | 5.038 | Jan 2020 | - | | 5.038 | Continuing | Continuing | - |
| Subtotal | | | - | 2.200 | | 4.380 | | 5.038 | | - | | 5.038 | Continuing | Continuing | N/A |

Remarks
This project is a new start in FY 2018.

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Air Force Research Laboratory (AFRL), Booz Allen Hamilton (BAH), Software Engineering Institute (SEI) | Various | Various : Various | - | 1.600 | Apr 2018 | 1.800 | Jan 2019 | 1.800 | Jan 2020 | - | | 1.800 | Continuing | Continuing | - |
| Subtotal | | | - | 1.600 | | 1.800 | | 1.800 | | - | | 1.800 | Continuing | Continuing | N/A |

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|
| Project Cost Totals | - | 3.800 | 6.180 | 6.838 | - | 6.838 | Continuing | Continuing | N/A |

Remarks

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|---|---|---|
| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604414F / <i>Cyber Resiliency of Weapon Systems-ACS</i> | Project (Number/Name) 642836 / <i>Mission Thread Analysis</i> |

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| <i>Mission Thread Analysis</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Prioritize and conduct cyber mission thread analyses | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Establish cyber tool set and libraries | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Train Cyber Mission Thread Analysis (CMTA) processes and tools and Institutionalize into policy and processes | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Prototype analysis methodologies, techniques, tools and equipment | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604414F / <i>Cyber Resiliency of Weapon Systems-ACS</i> | Project (Number/Name) 642836 / <i>Mission Thread Analysis</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|---|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Mission Thread Analysis</i> | | | | |
| Prioritize and conduct cyber mission thread analyses | 3 | 2018 | 4 | 2024 |
| Establish cyber tool set and libraries | 3 | 2018 | 4 | 2024 |
| Train Cyber Mission Thread Analysis (CMTA) processes and tools and Institutionalize into policy and processes | 2 | 2020 | 4 | 2024 |
| Prototype analysis methodologies, techniques, tools and equipment | 4 | 2018 | 4 | 2020 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0604776F / <i>Deployment & Distribution Enterprise R&D</i> |
|--|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 25.597 | 27.964 | 28.034 | 0.000 | 28.034 | 28.939 | 30.051 | 30.597 | 31.148 | Continuing | Continuing |
| 640211: <i>GLOBAL ACCESS</i> | - | 6.868 | 7.718 | 7.493 | 0.000 | 7.493 | 7.644 | 7.804 | 7.945 | 8.088 | Continuing | Continuing |
| 640212: <i>C2/OPTIMIZATION/ MODELING AND SIMULATION</i> | - | 13.918 | 15.050 | 15.183 | 0.000 | 15.183 | 15.856 | 16.695 | 16.999 | 17.305 | Continuing | Continuing |
| 640213: <i>CYBER</i> | - | 4.811 | 5.196 | 5.358 | 0.000 | 5.358 | 5.439 | 5.552 | 5.653 | 5.755 | Continuing | Continuing |

Note

- This program, BA 4, PE 0604776F, project 640211, Autonomous 60K Tunner, is a new start.
- This program, BA 4, PE 0604776F, project 640211, Interoperable Multi-modal Patient Movement, is a new start.
- This program, BA 4, PE 0604776F, project 640211, Replenishment from Ships to Point of Need Delivery, is a new start.
- This program, BA 4, PE 0604776F, project 640211, Use of Dual Row Airdrop System with Joint Light Tactical Vehicle, is a new start.
- This program, BA 4, PE 0604776F, project 640212, Strategies for Artificial Intelligence and Machine Learning, is a new start.

A. Mission Description and Budget Item Justification

This program provides for the development, integration, demonstration and detailed assessment of capabilities which improve deployment, distribution and supply chain decision-making/collaboration (e.g., planning stage to real-time execution/retrograde operations) without need for highly specialized operators. Projects in this area address the following: decision support tools, distribution process simulations/analytics, distribution demand forecasting/execution monitoring, automated decision-maker support (e.g., queuing, alerting, courses of action), automated status monitoring with information fusion to include drilldown capability, and resilient Command & Control (C2) infrastructure capabilities. Current planning, forecasting, and collaboration capabilities do not permit full synchronization of people, processes and assets to execute planned operations. Automated tools must be able to dynamically analyze/predict demand and provide input to advanced distribution planning systems to include the capability for Combatant Commanders to manage theater transportation operations from the port of debarkation to the point of need. Transportation information exchange across the DOD is inhibited by disparate systems, multiple data standards and insufficient interfaces. The ability to rapidly determine the impact of any delays/changes and conduct "what-if" impact assessments on the closure of force packages is required. This project addresses the required mission support to combatant commanders and other customers in the area of C2, Optimization, and Modeling and Simulations.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|--|---|
| Appropriation/Budget Activity | R-1 Program Element (Number/Name) |
| 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | PE 0604776F / <i>Deployment & Distribution Enterprise R&D</i> |

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 26.222 | 28.350 | 28.937 | 0.000 | 28.937 |
| Current President's Budget | 25.597 | 27.964 | 28.034 | 0.000 | 28.034 |
| Total Adjustments | -0.625 | -0.386 | -0.903 | 0.000 | -0.903 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -0.625 | -0.386 | | | |
| • Other Adjustments | 0.000 | 0.000 | -0.903 | 0.000 | -0.903 |

Change Summary Explanation

FY 2018 funds include \$0.015 million pending transfer to the Rapid Prototyping Fund in accordance with PL 114-92; section 828, Penalty for Cost Overruns, as amended by PL 115-91 section 825(a).

FY 2019 funds include \$0.058 million withhold pending final determination of Penalty for Cost Overruns in accordance with PL 114-92 as amended by PL 115 -91 section 825(a).

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|---|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604776F / <i>Deployment & Distribution Enterprise R&D</i> | Project (Number/Name) 640211 / <i>GLOBAL ACCESS</i> |
|--|---|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|------------------------------|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| 640211: <i>GLOBAL ACCESS</i> | - | 6.868 | 7.718 | 7.493 | 0.000 | 7.493 | 7.644 | 7.804 | 7.945 | 8.088 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

Note

This program, BA 4, PE 0604776F, project 640211, Autonomous 60K Tunner, is a new start.
 This program, BA 4, PE 0604776F, project 640211, Interoperable Multi-modal Patient Movement, is a new start.
 This program, BA 4, PE 0604776F, project 640211, Replenishment from Ships to Point of Need Delivery, is a new start.
 This program, BA 4, PE 0604776F, project 640211, Use of Dual Row Airdrop System with Joint Light Tactical Vehicle, is a new start.

In FY 2017, PE 0603713S (BA3) Deployment and Distribution Enterprise Technology (DDET) and PE 0603264S (BA3) Agile Transportation for the 21st Century Theater were transferred to a single PE in the Air Force budget (PE0604776F, (BA4) Deployment and Distribution Enterprise (DDE)) in order to support auditability, increase management efficiency, and reduce administrative actions.

A. Mission Description and Budget Item Justification

This program provides for the development, integration, demonstration and detailed assessment of DOD procedures/technologies targeted at optimizing throughput at the nodes as well as across the conduits of the deployment and distribution supply chains, from origin to point of use as well as return. Needed capabilities include inventory/cargo management, materiel handling innovations, improved physical node access, port throughput improvements, innovative delivery methods (e.g., precision airlift, autonomous re-supply), and cargo/container security. This project addresses required mission support to combatant commanders and other customers of DOD's distribution and transportation systems in the area of deployment/distribution velocity management, manned/unmanned systems to the point of effect, and increased global reach in austere/anti-access environments.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|--|---------|---------|---------|
| Title: Contingency Response Wing Mobile Power Generator | 0.125 | 0.000 | 0.000 |
| Description: Develop mobile variable output power generation prototype for the CRW that is 188; the size of current generators, has a decreased fuel burn rate, and increased maintenance reliability rate. | | | |
| FY 2019 Plans: Project ended in FY18 | | | |
| FY 2020 Plans: Project ended in FY 2018 | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: | | | |

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|--|---|---|----------------|----------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604776F / <i>Deployment & Distribution Enterprise R&D</i> | Project (Number/Name) 640211 / <i>GLOBAL ACCESS</i> | | |
| B. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| No funding in FY 2020 | | | | |
| <p>Title: Autonomous 60K Tunner</p> <p>Description: Autonomous Technologies applied to the 60K Tunner to improve throughput and safety</p> <p>FY 2020 Plans: Apply semi autonomous technologies and testing</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Project starts in FY20</p> | | - | - | 0.500 |
| <p>Title: Interoperable Multi-modal Patient Movement</p> <p>Description: Create system to move mass casualties when air medivac is not available</p> <p>FY 2020 Plans: Develop interoperable multi-modal platform</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Project starts in FY20</p> | | - | - | 0.500 |
| <p>Title: Replenishment from Ships to Point of Need Delivery</p> <p>Description: Unmanned system launched from ships and capable of carrying supplies up to 100 miles inland.</p> <p>FY 2020 Plans: testing various payloads and distance calculations</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Project starts in FY20</p> | | - | - | 0.500 |
| <p>Title: Use of Dual Row Airdrop System with Joint Light Tactical Vehicle</p> <p>Description: Increasing the strength of C-17 dual row rails to enable dropping the JLTV</p> <p>FY 2020 Plans: Testing of above-the-floor release mechanisms</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p> | | - | - | 1.250 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604776F / <i>Deployment & Distribution Enterprise R&D</i> | Project (Number/Name) 640211 / <i>GLOBAL ACCESS</i> | | |
| B. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| Project Starts in FY20 | | | | |
| <p>Title: Port Improvement via Exigent Repair (PIER) JCTD</p> <p>Description: Develop robust capability to rapidly restore damaged pier to a minimal militarily-capable to support reception, power projection & sustainment operations.</p> <p>FY 2019 Plans: TRL 6-7: Mooring, fendering and fuel discharge: Will address expedient repair to mooring and fender systems with an emphasis on assuring structural integrity</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Project funding ends in FY19</p> | | 1.653 | 2.255 | - |
| <p>Title: Autonomous Aerial Insertion and Resupply into Dense Urban Complex Terrain (AAIRDUCT) Joint Capabilities Technology Demonstration (JCTD)</p> <p>Description: Enhance capability of a guided airdrop system to navigate in contested/denied environments where Global Positioning System data is either suspect or unavailable.</p> <p>FY 2019 Plans: TRL 5: U.S. Army (Natick) led effort to prototype technologies to enable accurate delivery of airdropped supplies in a Global positioning System (GPS) denied environment.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Project funding ends in FY19</p> | | 0.729 | 1.180 | - |
| <p>Title: Enhanced Vision Navigation for Joint Precision Airdrop System (Supports FY17 AAIRDUCT JCTD)</p> <p>Description: Advanced technologies to improve airdrop capabilities to the warfighter.</p> <p>FY 2019 Plans: TRL 6: Support for transition</p> <p>FY 2020 Plans: Project support requirement</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding levels increase as development progresses</p> | | 1.186 | 0.459 | 0.505 |
| <p>Title: Expeditionary End-to-End Fueling Concept</p> | | 0.650 | 0.700 | 0.800 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604776F / <i>Deployment & Distribution Enterprise R&D</i> | Project (Number/Name) 640211 / <i>GLOBAL ACCESS</i> | | |
| B. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| <p>Description: Addressing gap in theater fuel delivery/distribution capabilities to inform the development of the Army Early Entry Fluid Distribution System as well as provide a development path for Navy/USMC ship-to-shore capabilities.</p> <p>FY 2019 Plans: TRL 6: Proof of concept prototype system including a field expedient planning tool and networked control capability.</p> <p>FY 2020 Plans: demonstration of fueling ashore operations</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Project funding ends in FY19</p> | | | | |
| <p>Title: Dropsonde Optimization</p> <p>Description: Mobility assets lack drop zone situational awareness, pre-drop confirmation of clear/safe drop zone, capability of post-drop assessment, and autonomous/passive bundle geo-location.</p> <p>FY 2019 Plans: TRL 4-7: Interface designs and algorithm coding completed</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Project funding ends in FY19</p> | | 0.055 | 0.414 | - |
| <p>Title: Advanced Planning for Global Response Force Mission</p> <p>Description: Create and leverage analytical and visual tools to provide planners the ability to streamline GRF missions, integrating aircraft load planning with sophisticated airdrop mission simulations.</p> <p>FY 2019 Plans: Development of prototype planning software.</p> <p>FY 2020 Plans: Completing planning tool development</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Project funding levels increase as development schedule progresses</p> | | 0.300 | 0.400 | 0.500 |
| <p>Title: Autonomous Drone Delivery from Airdrop Systems</p> <p>Description: An air-droppable Unmanned Aircraft System (UAS) to conduct resupply missions in densely populated urban areas.</p> | | 0.300 | 0.310 | 0.400 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604776F / <i>Deployment & Distribution Enterprise R&D</i> | Project (Number/Name) 640211 / <i>GLOBAL ACCESS</i> | | |
| B. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| <p>FY 2019 Plans: Drone hardware development and integration.</p> <p>FY 2020 Plans: development and demonstration of drone delivery from JPADS</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding levels increase as development progresses</p> | | | | |
| <p>Title: Mini Robotic Dredge</p> <p>Description: Prototype a tactical dredging capability to deepen an usable port facility</p> <p>FY 2019 Plans: TRL 5-6: Evaluate various cutter heads to determine those suitable for the various types of sediments</p> <p>FY 2020 Plans: Complete development of dredge and demo</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding levels increase as development progresses</p> | | 0.520 | 0.600 | 0.700 |
| <p>Title: Optimized HALO Delivery using Probabilistic Airdrop Planner</p> <p>Description: A low-cost, low-complexity solution to deliver payloads at improved accuracy, compared to standard ballistic parachutes, but without the expensive parafoil and guidance systems</p> <p>FY 2019 Plans: Develop planner to help optimize airdrop accuracy</p> <p>FY 2020 Plans: complete development of planner</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding levels increases as development progresses</p> | | 0.350 | 0.400 | 0.500 |
| <p>Title: Expedient and Expeditionary Airfield Damage Repair</p> <p>Description: Provide a truly expeditionary, indigenous-material based repair capability to support high pace, aircraft sortie generation, recovery and egress</p> | | 0.500 | 0.500 | 1.338 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604776F / <i>Deployment & Distribution Enterprise R&D</i> | Project (Number/Name) 640211 / <i>GLOBAL ACCESS</i> |

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| <p><i>FY 2019 Plans:</i> Demonstrate the ability to rapidly assess airfield damage</p> <p><i>FY 2020 Plans:</i> Demonstrate and complete development of repair effort</p> <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> Project funding increases as development progresses</p> | | | |
| <p><i>Title:</i> Unmanned Logistics System - Air</p> <p><i>Description:</i> Provides the warfighter with an assured/organic resupply capability to sustain maneuver units</p> <p><i>FY 2019 Plans:</i> Capabilities to support last tactical mile distribution</p> <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> Project funding ends in FY19</p> | 0.500 | 0.500 | - |
| Accomplishments/Planned Programs Subtotals | 6.868 | 7.718 | 7.493 |

C. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

D. Acquisition Strategy

Requirements for joint deployment and distribution enterprise technology enhancements are annually identified, validated and prioritized by the Joint Deployment & Distribution Enterprise (JDDE) community. Pursuit of the development of new capabilities to meet these requirements is managed by the United States Transportation Command (USTRANSCOM). Prototype products, once evaluated by the users, are spirally transitioned by the operational community.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604776F / <i>Deployment & Distribution Enterprise R&D</i> | Project (Number/Name) 640211 / <i>GLOBAL ACCESS</i> |
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| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---------------------------------|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Integrated Logistics Support | Various | Various : Belleville, IL | - | 6.868 | Nov 2017 | 7.718 | Nov 2018 | 7.493 | Nov 2019 | - | | 7.493 | Continuing | Continuing | - |
| Subtotal | | | - | 6.868 | | 7.718 | | 7.493 | | - | | 7.493 | Continuing | Continuing | N/A |

Remarks
Funds will be realigned within the PE.

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|
| Project Cost Totals | - | 6.868 | 7.718 | 7.493 | - | 7.493 | Continuing | Continuing | N/A |

Remarks

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604776F / <i>Deployment & Distribution Enterprise R&D</i> | Project (Number/Name) 640211 / <i>GLOBAL ACCESS</i> |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|--|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

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| <i>Deployment and Distribution</i> | |
| Integrated Logistics Support | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604776F / <i>Deployment & Distribution Enterprise R&D</i> | Project (Number/Name) 640211 / <i>GLOBAL ACCESS</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|------------------------------------|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Deployment and Distribution</i> | | | | |
| Integrated Logistics Support | 1 | 2018 | 4 | 2021 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 4 | | | | | R-1 Program Element (Number/Name) PE 0604776F / <i>Deployment & Distribution Enterprise R&D</i> | | | | Project (Number/Name) 640212 / <i>C2/OPTIMIZATION/MODELING AND SIMULATION</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 640212: <i>C2/OPTIMIZATION/MODELING AND SIMULATION</i> | - | 13.918 | 15.050 | 15.183 | 0.000 | 15.183 | 15.856 | 16.695 | 16.999 | 17.305 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

Note

This program, BA 4, PE 0604776F, project 640212, Strategies for Artificial Intelligence and Machine Learning, is a new start.

In FY 2017, PE 0603713S (BA3) Deployment and Distribution Enterprise Technology (DDET) and PE 0603264S (BA3) Agile Transportation for the 21st Century Theater were transferred to a single PE in the Air Force budget (PE0604776F, (BA4) Deployment and Distribution Enterprise (DDE)) in order to support auditability, increase management efficiency, and reduce administrative actions.

A. Mission Description and Budget Item Justification

This program provides for the development, integration, demonstration and detailed assessment of capabilities which improve deployment, distribution and supply chain decision-making/collaboration (e.g., planning stage to real-time execution/retrograde operations) without need for highly specialized operators. Projects in this area address the following: decision support tools, distribution process simulations/analytics, distribution demand forecasting/execution monitoring, automated decision-maker support (e.g., queuing, alerting, courses of action), automated status monitoring with information fusion to include drilldown capability, and resilient Command & Control (C2) infrastructure capabilities. Current planning, forecasting, and collaboration capabilities do not permit full synchronization of people, processes and assets to execute planned operations. Automated tools must be able to dynamically analyze/predict demand and provide input to advanced distribution planning systems to include the capability for Combatant Commanders to manage theater transportation operations from the port of debarkation to the point of need. Transportation information exchange across the DOD is inhibited by disparate systems, multiple data standards and insufficient interfaces. The ability to rapidly determine the impact of any delays/changes and conduct "what-if" impact assessments on the closure of force packages is required. This project addresses the required mission support to combatant commanders and other customers in the area of C2, Optimization, and Modeling and Simulations.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| Title: TRANSCOM Innovation Unit Experimental | 0.016 | 2.045 | 3.015 |
| Description: Rapidly develop and integrate technology solutions for the enterprise | | | |
| FY 2019 Plans: TRL 4-7: Identify challenges and garner/develop solutions to address those challenges | | | |
| FY 2020 Plans: Develop solutions to identified challenges | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: | | | |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604776F / <i>Deployment & Distribution Enterprise R&D</i> | Project (Number/Name) 640212 / <i>C2/OPTIMIZATION/MODELING AND SIMULATION</i> | | |
| B. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| Support for pending FY19/20 JCTDs | | | | |
| Title: Analytics Driven Command Decision Support Description: Developing the capability that improves organizational decision making by providing a holistic methodology that capitalizes on relevant information, captures accurate data, and leverages best practice tools and decision-making processes. FY 2019 Plans: Develop decision support best practices for rapid decision making FY 2020 Plans: No funding in FY 2020 FY 2019 to FY 2020 Increase/Decrease Statement: FY19 last year of funding | | 0.610 | 0.507 | 0.000 |
| Title: Prevalent Vendor Threat Monitoring Description: Enhanced decision making capability using commercially available business intelligence tools to capture and mitigate near real-time 4th component readiness risks FY 2019 Plans: Project ended in FY18 FY 2020 Plans: No funding in FY 2020 FY 2019 to FY 2020 Increase/Decrease Statement: No funding in FY 2020 | | 0.075 | 0.000 | 0.000 |
| Title: Strategies for Artificial Intelligence and Machine Learning Description: This research effort is to demonstrate the potential of AI/ML to increase the effectiveness and value of USTRANSCOM's Big Data initiatives while also leveraging cloud computing capabilities. FY 2020 Plans: improved data quality and improved analytic capabilities. FY 2019 to FY 2020 Increase/Decrease Statement: improved data quality and improved analytic capabilities. | | - | - | 0.750 |
| Title: Data Lake | | 3.506 | 0.800 | 0.000 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604776F / <i>Deployment & Distribution Enterprise R&D</i> | Project (Number/Name) 640212 / <i>C2/OPTIMIZATION/MODELING AND SIMULATION</i> | | |
| B. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| <p>Description: Develop and demonstrate the capability that allows incongruent data to be brought together to provide automated decision support.</p> <p>FY 2019 Plans: TRL 5-6: Refined reference architecture for a data lake environment targeting performance, usability and data integration</p> <p>FY 2020 Plans: Funding ends in FY19</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding ends in FY19</p> | | | | |
| <p>Title: End-to-End Deployment and Distribution Modeling</p> <p>Description: Provide an integrated deployment/distribution environment to provide continuous and optimal balancing of total demand verse capacity from planning through mission execution.</p> <p>FY 2019 Plans: TRL 5-6: Enable users to fully exploit technologies more rapidly and improve analytics</p> <p>FY 2020 Plans: Increase analytical capability for DoD programmatic studies and analysis</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding ends in FY19</p> | | 1.228 | 3.069 | 2.588 |
| <p>Title: Global Mission Scheduling</p> <p>Description: Development effort to optimize air movement requirements against resources and movement requirements.</p> <p>FY 2019 Plans: Project ended in FY18</p> <p>FY 2020 Plans: Project ended in FY18</p> | | 0.535 | 0.000 | 0.000 |
| <p>Title: Map Based Planning Services</p> <p>Description: Enable planners, via a collaborative geospatially enabled environment, to conduct deliberate course of action planning to include force flow feasibility concurrent with plan development.</p> | | 1.500 | 0.000 | 0.000 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604776F / <i>Deployment & Distribution Enterprise R&D</i> | Project (Number/Name) 640212 / <i>C2/OPTIMIZATION/MODELING AND SIMULATION</i> | | |
| B. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| FY 2019 Plans: Project ended in FY18 | | | | |
| FY 2020 Plans: Project ended in FY18 | | | | |
| Title: Massachusetts Institute of Technology Lincoln Labs Description: Partnership with MIT-LL to research efforts to improve enterprise operational architecture supporting high-end analytics, integrated information technology/data structures, understanding of cloud capabilities and multi-level cyber security defense. FY 2019 Plans: TRL 6: Improved basis for network optimization and network design. FY 2020 Plans: Effective secure operations enabled via data fusion frameworks and prototypes. FY 2019 to FY 2020 Increase/Decrease Statement: Approved ability to rapidly estimate tanker requirements and improve operational efficiencies | | 2.221 | 2.552 | 3.000 |
| Title: Modeling & Simulation Innovation Description: Select student research/faculty-assisted projects (e.g., Joint Transportation Asset Scheduling Kit, Next Generation Cargo Capability, Applying Post Modern Portfolio Theory to Mitigate Risk in International Shipping, Optimal CH-47/C-130 Workload Balance, Remotely Piloted Aircraft Performing Airdrop Mission). FY 2019 Plans: TRL 4-6: Collaborative partnership with Air Force Institute of Technology for graduate research addressing Joint Deployment and Distribution challenges. FY 2020 Plans: Collaboration partnership with AFIT for student research | | 0.045 | 0.125 | 0.125 |
| Title: Support Planning for Air Refueling Tasking and Allocation Description: Provide collaborative decision aid to enable planners to the optimize use of the worldwide Active Duty, Air National Guard and Air Force Reserve Air Refueling fleets while maintaining or increasing operational effectiveness, agility and capacity. FY 2019 Plans: | | 0.162 | 0.000 | 0.000 |

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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604776F / <i>Deployment & Distribution Enterprise R&D</i> | Project (Number/Name) 640212 / <i>C2/OPTIMIZATION/MODELING AND SIMULATION</i> | | |
| B. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| Project ended in FY18 | | | | |
| FY 2020 Plans: Project ended in FY18 | | | | |
| Title: Strategies for Enterprise Metadata Management | | 0.375 | 0.000 | 0.000 |
| Description: Comprehensive account of strategies, optional implementations and recommendations for enterprise-wide management of metadata. | | | | |
| FY 2019 Plans: Project ended in FY18 | | | | |
| FY 2020 Plans: Project ended in FY18 | | | | |
| Title: Technology Transfer | | 0.174 | 0.290 | 0.295 |
| Description: U. S. Transportation Command uses Technology Transfer mechanisms of the Federal Laboratories to facilitate voluntary collaboration by experts from government, industry, and academia, revealing the costs and benefits of innovations, to understand the feasibility of future capabilities. | | | | |
| FY 2019 Plans: TRL 4 - 6: Continue to actively promote and broker Cooperative Research and Development Agreements (CRADAs) between DOD labs and industry for development of technology with both commercial and military applications. This activity will particularly focus on non-traditional defense contractors and is intended to help lower the expense of new defense-related technology development through cost-sharing with industry and to help DOD benefit from private-sector technology investments and innovations. Continue to actively market DOD-developed technologies to U.S. companies and establish Patent License Agreements to commercialize these technologies for both civilian and military. | | | | |
| FY 2020 Plans: TRL 4 - 6: Continue to actively promote and broker Cooperative Research and Development Agreements (CRADAs) between DOD labs and industry for development of technology with both commercial and military applications. This activity will particularly focus on non-traditional defense contractors and is intended to help lower the expense of new defense-related technology development through cost-sharing with industry and to help DOD benefit from private-sector technology investments and innovations. Continue to actively market DOD-developed technologies to U.S. companies and establish Patent License Agreements to commercialize these technologies for both civilian and military. | | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: | | | | |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604776F / <i>Deployment & Distribution Enterprise R&D</i> | Project (Number/Name) 640212 / <i>C2/OPTIMIZATION/MODELING AND SIMULATION</i> | | |
| B. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| No significant increase | | | | |
| <p>Title: Infrastructure Information Confidence Model</p> <p>Description: Inform decision makers of the quality of primary and alternate data sources they are using to make decisions</p> <p>FY 2019 Plans: Information collaboration process that analyzes and provides a confidence assessment of structured and unstructured data</p> <p>FY 2020 Plans: Continue development of information collaboration process that analyzes and provides a confidence assessment of structured and unstructured data</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Project funding varies as development progresses</p> | | 0.200 | 0.918 | 1.137 |
| <p>Title: Program Execution</p> <p>Description: Provide technical assistance and program management support to the USTRANSCOM RDT&E Program.</p> <p>FY 2019 Plans: TRL 4-6: Program support to explore technology solutions to capability gaps identified through Joint Concept Development documents, the Joint capabilities Integration and Development System process, Joint Experimentation, etc, to increase the responsiveness, efficiency and effectiveness of the Joint Deployment and Distribution Enterprise.</p> <p>FY 2020 Plans: TRL 4-6: Program support to explore technology solutions to capability gaps identified through Joint Concept Development documents, the Joint capabilities Integration and Development System process, Joint Experimentation, etc, to increase the responsiveness, efficiency and effectiveness of the Joint Deployment and Distribution Enterprise.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: No significant increase</p> | | 0.861 | 1.420 | 1.475 |
| <p>Title: Synchronizing Mobility Allocations and Resources for Transportation</p> <p>Description: Develop prototype software for advanced squadron scheduling, collaboration, and predictive modeling.</p> <p>FY 2019 Plans: Design of the squadron scheduler and visualizations.</p> <p>FY 2020 Plans:</p> | | 0.800 | 1.700 | 1.450 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604776F / <i>Deployment & Distribution Enterprise R&D</i> | Project (Number/Name) 640212 / <i>C2/OPTIMIZATION/MODELING AND SIMULATION</i> | | |
| B. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| Complete development of the squadron scheduler and visualizations. FY 2019 to FY 2020 Increase/Decrease Statement: Project funding varies as development progresses | | | | |
| Title: Full Spectrum Mission Assurance Description: All-threats/hazards, collaborative transportation risk management activity to identify unacceptable physical/cyber risks FY 2019 Plans: TRL 5-7: An operational picture environment fed by standardized, reusable, and shareable data layers of actionable info. FY 2020 Plans: Complete the operational picture environment fed by standardized, reusable, and shareable data layers of actionable info. FY 2019 to FY 2020 Increase/Decrease Statement: No significant increase | | 0.810 | 0.814 | 0.998 |
| Title: Modeling Dynamics of Modular Causeways to Improve Debarkation Sites Description: High-fidelity model to provide planners with precise knowledge of Modular Causeway behavior. FY 2019 Plans: TRL 4-7: Design mockups, Design testing, population of database, demonstration and training FY 2020 Plans: Population of database, demonstration and training FY 2019 to FY 2020 Increase/Decrease Statement: Shifted funds to optimize development | | 0.320 | 0.330 | 0.350 |
| Title: Web Based Seaport Explosive Safety Planning Description: Provide seaport planners capability to manage net explosive weight/hazard munitions FY 2019 Plans: TRL 4-6: Reduce planner port layout from 80 to 5 hours FY 2019 to FY 2020 Increase/Decrease Statement: | | 0.480 | 0.480 | - |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604776F / <i>Deployment & Distribution Enterprise R&D</i> | Project (Number/Name) 640212 / <i>C2/OPTIMIZATION/MODELING AND SIMULATION</i> |

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| Project ends in FY19 | | | |
| Accomplishments/Planned Programs Subtotals | 13.918 | 15.050 | 15.183 |

C. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

D. Acquisition Strategy

Requirements for joint deployment and distribution enterprise technology enhancements are annually identified, validated and prioritized by the Joint Deployment & Distribution Enterprise (JDDE) community. Pursuit of the development of new/improved capabilities to meet these requirements is managed by the United States Transportation Command (USTRANSCOM). Prototype products, once evaluated by the users, are spirally transitioned by the operational community.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|---|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604776F / <i>Deployment & Distribution Enterprise R&D</i> | Project (Number/Name) 640212 / <i>C2/OPTIMIZATION/MODELING AND SIMULATION</i> |
|--|---|---|

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---------------------------------|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Integrated Logistics Support | Various | Various : Belleville, IL | - | 13.918 | Nov 2017 | 15.050 | Nov 2018 | 15.183 | Nov 2019 | - | | 15.183 | Continuing | Continuing | - |
| Subtotal | | | - | 13.918 | | 15.050 | | 15.183 | | - | | 15.183 | Continuing | Continuing | N/A |

Remarks
Funds will be realigned within PE.

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Contractor Support PMO | Various | Various : Belleville, IL | - | - | | - | | - | | - | | - | Continuing | Continuing | - |
| Subtotal | | | - | - | | - | | - | | - | | - | Continuing | Continuing | N/A |

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|
| Project Cost Totals | - | 13.918 | 15.050 | 15.183 | - | 15.183 | Continuing | Continuing | N/A |

Remarks

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|---|---|---|
| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604776F / <i>Deployment & Distribution Enterprise R&D</i> | Project (Number/Name) 640212 / <i>C2/OPTIMIZATION/MODELING AND SIMULATION</i> |

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
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| <i>Deployment and Distribution</i> | |
| Integrated Logistics Support | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604776F / <i>Deployment & Distribution Enterprise R&D</i> | Project (Number/Name) 640212 / <i>C2/OPTIMIZATION/MODELING AND SIMULATION</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|---|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Deployment and Distribution</i> | | | | |
| Integrated Logistics Support | 1 | 2018 | 4 | 2021 |

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604776F / <i>Deployment & Distribution Enterprise R&D</i> | Project (Number/Name) 640213 / <i>CYBER</i> |
|--|---|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| 640213: <i>CYBER</i> | - | 4.811 | 5.196 | 5.358 | 0.000 | 5.358 | 5.439 | 5.552 | 5.653 | 5.755 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

Note

In FY 2017, PE 0603713S (BA3) Deployment and Distribution Enterprise Technology (DDET) and PE 0603264S (BA3) Agile Transportation for the 21st Century Theater were transferred to a single PE in the Air Force budget (PE0604776F, (BA4) Deployment and Distribution Enterprise (DDE)) in order to support auditability, increase management efficiency, and reduce administrative actions.

A. Mission Description and Budget Item Justification

This program provides for the development, integration, demonstration and detailed assessment of capabilities to ensure USTRANSCOM mission assurance is in a persuasive/dynamic cyber environment. USTRANSCOM requires the procedures/technologies to improve cyber surveillance and control of networks across multiple domains and the ability to continue critical network operations in contested unclassified and classified network environments. The Command also needs the ability to differentiate between valid/unauthorized users and determine/quantify the trustworthiness of hardware/software systems. Additionally USTRANSCOM must have the ability to rapidly analyze & correlate data regarding malicious activities, select/evoke real-time defense actuators, perform automated reasoning capabilities that address data quality issues, and the ability to rapidly return to a known/safe operating state.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|---|---------|---------|---------|
| <p>Title: Identity and Access Management</p> <p>Description: Need secure means to credential user access to proper applications & data via single sign approach.</p> <p>FY 2019 Plans: N/A</p> <p>FY 2020 Plans: N/A</p> | 0.130 | 0.000 | 0.000 |
| <p>Title: Operationalizing Cyber Security</p> <p>Description: Provide USTRANSCOM Joint Cyber Center (JCC) organizational effectiveness tools to enhance cyber-security operations, plans & processes.</p> <p>FY 2019 Plans: N/A</p> <p>FY 2020 Plans:</p> | 0.638 | 0.000 | 0.000 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604776F / <i>Deployment & Distribution Enterprise R&D</i> | Project (Number/Name) 640213 / <i>CYBER</i> | | |
| B. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| N/A | | | | |
| <p>Title: Lincoln Labs</p> <p>Description: Partnership with MIT-LL to research efforts to improve enterprise operational architecture supporting high-end analytics, integrated information technology/data structures, understanding of cloud capabilities and multi-level cyber security defense.</p> <p>FY 2019 Plans: TRL 4-6: Multi-faceted prototyping numerous technologies to enhance cyber.</p> <p>FY 2020 Plans: Increased awareness and ability to respond to cyber events</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Yearly funding varies depending on development schedule</p> | | 3.713 | 3.885 | 4.021 |
| <p>Title: Operationally Transparent Cyber</p> <p>Description: Rapidly identify, track, and eliminate malicious actor behavior and defend against Advanced Persistent Threats in near real-time</p> <p>FY 2019 Plans: Increase activity detection rate</p> <p>FY 2020 Plans: Functionality to increase detection</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Yearly funding varies depending on development schedule</p> | | 0.330 | 1.311 | 1.337 |
| Accomplishments/Planned Programs Subtotals | | 4.811 | 5.196 | 5.358 |
| C. Other Program Funding Summary (\$ in Millions) | | | | |
| N/A | | | | |
| Remarks | | | | |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604776F / <i>Deployment & Distribution Enterprise R&D</i> | Project (Number/Name) 640213 / <i>CYBER</i> |

D. Acquisition Strategy

Requirements for joint deployment and distribution enterprise technology enhancements are annually identified, validated and prioritized by the Joint Deployment & Distribution Enterprise (JDDE) community. Pursuit of the development of new/improved capabilities to meet these requirements is managed by the United States Transportation Command (USTRANSCOM). Prototype products, once evaluated by the users, are spirally transitioned by the operational community.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|---|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604776F / <i>Deployment & Distribution Enterprise R&D</i> | Project (Number/Name) 640213 / <i>CYBER</i> |
|--|---|---|

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---------------------------------|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Integrated Logistics Support | Various | Various : Belleville, IL | - | 4.811 | Nov 2017 | 5.196 | Nov 2018 | 5.358 | Nov 2019 | - | | 5.358 | Continuing | Continuing | - |
| Subtotal | | | - | 4.811 | | 5.196 | | 5.358 | | - | | 5.358 | Continuing | Continuing | N/A |

Remarks
Funds will be realigned within the PE.

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|
| Project Cost Totals | - | 4.811 | 5.196 | 5.358 | - | 5.358 | Continuing | Continuing | N/A |

Remarks

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|---|---|---|
| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604776F / <i>Deployment & Distribution Enterprise R&D</i> | Project (Number/Name) 640213 / <i>CYBER</i> |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|--|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

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|---|--|
| <i>Deployment and Distribution</i> | |
| Integrated Logistics Support | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604776F / <i>Deployment & Distribution Enterprise R&D</i> | Project (Number/Name) 640213 / <i>CYBER</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|------------------------------------|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Deployment and Distribution</i> | | | | |
| Integrated Logistics Support | 1 | 2018 | 4 | 2021 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0604858F / <i>Tech Transition Program</i> |
|--|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|--------------------------------|-------------|-----------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 1,079.458 | 167.277 | 128.476 | 26.450 | 154.926 | 280.495 | 259.521 | 158.734 | 75.159 | Continuing | Continuing |
| 645350: <i>Experimentation</i> | - | 202.419 | 86.820 | 81.798 | 0.000 | 81.798 | 81.671 | 83.370 | 84.889 | 75.159 | Continuing | Continuing |
| 645351: <i>Prototyping</i> | - | 877.039 | 80.457 | 46.678 | 26.450 | 73.128 | 198.824 | 176.151 | 73.845 | 0.000 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

The Tech Transition Program provides funding to demonstrate, prototype, and experiment with technologies and concepts to enable or accelerate their transition to acquisition programs and/or operational use. The Technology Transition Program addresses the gap between initial technology or concept development and demonstration, and successful acquisition and operational capability implementation. Experimentation explores new concepts and their applications in potential future operating environments within a system-of-systems context. Prototyping enables integration and demonstration of emerging technologies to quickly move them into warfighting capability. The Tech Transition Program allows acquisition program managers (the capability developers) and warfighters (the capability recipients and end users) to prototype, integrate, and demonstrate candidate technologies and assess them in an operational environment in partnership with Program Executive Officers, schoolhouses, simulation facilities, and development planning organizations.

In FY 2019, the following efforts were transferred from PE 0604858F, Tech Transition Program: Advanced Engine Transition Program to PE 0604004F, Advanced Engine Development, Project 643608, Advanced Engine Development; Hypersonics Prototyping to PE 0604033F, Hypersonics Prototyping, Project 643885, Hypersonic Conventional Strike Weapon, and Project 643882, Air-Launched Rapid Response Weapon; and Directed Energy Prototyping to PE 0604032F, Directed Energy Prototyping, Project 640200, Directed Energy Prototyping. These transfers were Congressionally directed in the Department of Defense Appropriations Act of 2019 for greater transparency of Air Force prototyping activities.

In addition, this program element may include necessary civilian pay expenses required to manage, execute, and deliver weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, 0605898F, and 0605833F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
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| Appropriation/Budget Activity | R-1 Program Element (Number/Name) |
| 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | PE 0604858F / <i>Tech Transition Program</i> |

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 840.650 | 1,186.075 | 923.367 | 0.000 | 923.367 |
| Current President's Budget | 1,079.458 | 167.277 | 128.476 | 26.450 | 154.926 |
| Total Adjustments | 238.808 | -1,018.798 | -794.891 | 26.450 | -768.441 |
| • Congressional General Reductions | -0.241 | -0.385 | | | |
| • Congressional Directed Reductions | -15.867 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 226.000 | 30.000 | | | |
| • Congressional Directed Transfers | 0.000 | -1,048.413 | | | |
| • Reprogrammings | 66.659 | 0.000 | | | |
| • SBIR/STTR Transfer | -37.743 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | -794.891 | 26.450 | -768.441 |

Congressional Add Details (\$ in Millions, and Includes General Reductions)

Project: 645350: *Experimentation*

Congressional Add: *Program Increase - Light Attack Experimentation*

Congressional Add Subtotals for Project: 645350

Project: 645351: *Prototyping*

Congressional Add: *Program Increase - Competitively Awarded Technology Transition*

Congressional Add: *Program Increase - Directed Energy Prototyping*

Congressional Add: *Program Increase - Logistics Technologies*

Congressional Add: *Program Increase - Alternative Energy Research*

Congressional Add: *Program Increase - Assured Positioning Navigation and Timing (PNT)*

Congressional Add: *Program Increase - Laser Coating Removal Technology*

Congressional Add: *Program Increase - Health and Logistics Management Technology*

Congressional Add: *Program Increase - Competitively Awarded Technology Transition Initiatives*

Congressional Add Subtotals for Project: 645351

Congressional Add Totals for all Projects

| | FY 2018 | FY 2019 |
|--|----------------|----------------|
| | | |
| Congressional Add: <i>Program Increase - Light Attack Experimentation</i> | 96.706 | 0.000 |
| Congressional Add Subtotals for Project: 645350 | 96.706 | 0.000 |
| | | |
| Congressional Add: <i>Program Increase - Competitively Awarded Technology Transition</i> | 9.638 | 0.000 |
| Congressional Add: <i>Program Increase - Directed Energy Prototyping</i> | 67.464 | 0.000 |
| Congressional Add: <i>Program Increase - Logistics Technologies</i> | 9.156 | 0.000 |
| Congressional Add: <i>Program Increase - Alternative Energy Research</i> | 5.783 | 5.000 |
| Congressional Add: <i>Program Increase - Assured Positioning Navigation and Timing (PNT)</i> | 28.913 | 0.000 |
| Congressional Add: <i>Program Increase - Laser Coating Removal Technology</i> | 0.000 | 10.000 |
| Congressional Add: <i>Program Increase - Health and Logistics Management Technology</i> | 0.000 | 5.000 |
| Congressional Add: <i>Program Increase - Competitively Awarded Technology Transition Initiatives</i> | 0.000 | 10.000 |
| Congressional Add Subtotals for Project: 645351 | 120.954 | 30.000 |
| Congressional Add Totals for all Projects | 217.660 | 30.000 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force Date: February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0604858F / <i>Tech Transition Program</i> |
|--|--|

Change Summary Explanation

Decrease in FY 2018 of \$15.867 million due to Congressional directed reduction in the Consolidated Appropriation Act of 2018 for unjustified growth in experimentation campaigns.

Increase in FY 2018 of \$66.659 million due to reprogrammings for Hypersonics Prototyping and Multi-Domain Command and Control (MDC2) experimentation.

Decrease in FY 2019 of \$1,048.413 million due to the Congressional directed transfer of Advanced Engine Development (Advanced Engine Transition Program (AETP)), Hypersonics Prototyping, and Directed Energy Prototyping into separate program elements.

Decrease in FY 2020 base funding of \$789.927 million due to Congressional directed transfer of Advanced Engine Development (AETP), Hypersonics Prototyping, and Directed Energy Prototyping into separate program elements.

FY 2020 includes \$26.450 million of OCO.

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|---|--------------------|----------------|----------------|---------------------|--|----------------------|----------------|----------------|---|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 4 | | | | | R-1 Program Element (Number/Name) PE 0604858F / <i>Tech Transition Program</i> | | | | Project (Number/Name) 645350 / <i>Experimentation</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 645350: <i>Experimentation</i> | - | 202.419 | 86.820 | 81.798 | 0.000 | 81.798 | 81.671 | 83.370 | 84.889 | 75.159 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

The Experimentation project funds experimentation campaigns to explore new concepts and their applications in potential future operating environments within a system-of-systems context. Concepts and enabling technologies such as, but not limited to, artificial intelligence, machine learning, directed energy weapons and multi-domain operations hold great promise, yet their transition to acquisition programs and fielded capabilities is typically hampered due to uncertainties regarding their military application and organizational implications. Implementing successful transition approaches for complex and widely applicable concepts requires a comprehensive and coordinated campaign of learning. Experimentation campaigns enable organizational learning through the methodical and systematic application of experimentation and supporting analysis. Experimentation campaigns are centered on an operational level warfighting concept to provide context for assessment, and use wargaming, simulation, and field experimentation to evolve, refine, and validate the warfighting concept leading to solid, evidentiary-based materiel and non-materiel capability development approaches with associated recommendations. Experimentation campaigns improve the effectiveness of operations by developing concepts and generating new information to address challenging threats of the future which aids the fielding of advanced technologies by providing the credible evidence decision makers need to make sound strategic decisions and investment choices. Experimentation campaigns are directed by the Air Force Capability Development Council, Air Force Warfighting Integration Capability, and SAF/AQ, to ensure funding supports the highest Air Force priorities. Experimentation is focused on rapid learning and then pivoting based on that learning. Therefore, specific plans are not detailed to prevent locking into an approach that will likely shift based on current experimentation efforts. Further details can be provided in the appropriate forum.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Title: Experimentation Campaigns | 105.713 | 86.820 | 81.798 | - | 81.798 |
| Description: Execution of experimentation campaigns to explore promising concepts and enabling technologies. Activities may include facilitated workshops, wargaming, modeling and simulation, and virtual and hardware prototyping to enable experimentation campaigns. | | | | | |
| FY 2019 Plans: Conduct experimentation campaigns to include directed energy weapons for base defense, commercial space internet, as well as other high priority areas, as directed by the Air Force Capability Development Council, Air Force Warfighting Integration Capability, and SAF/AQ. Perform live-fly testing and connectivity with initial commercial demonstration spacecraft and conduct ground test of current Air Force unmanned aerial vehicle communication hardware with commercial systems to assess performance. Further details can be provided in the appropriate forum. | | | | | |
| FY 2020 Base Plans: | | | | | |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | Date: February 2019 |
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|--|--|---|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604858F / <i>Tech Transition Program</i> | Project (Number/Name) 645350 / <i>Experimentation</i> |
|--|--|---|

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|--|---------|---------|--------------|-------------|---------------|
| Continue experimentation campaigns to advance multi-domain operations and other high priority areas, as directed by the Air Force Capability Development Council, Air Force Warfighting Integration Capability, and SAF/AQ. Experimentation is focused on rapid learning and then pivoting based on that learning. Therefore, specific plans are not detailed to prevent locking into an approach that will likely shift based on current experimentation efforts. | | | | | |
| <i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> FY 2020 decreased compared to FY 2019 by \$5.022 million. Funding decreased due to higher Department of Defense priorities. | | | | | |
| Accomplishments/Planned Programs Subtotals | 105.713 | 86.820 | 81.798 | - | 81.798 |

| | FY 2018 | FY 2019 |
|---|---------|---------|
| <i>Congressional Add:</i> Program Increase - Light Attack Experimentation | 96.706 | 0.000 |
| <i>FY 2018 Accomplishments:</i> Conducted Congressionally-directed efforts | | |
| <i>FY 2019 Plans:</i> Not Applicable | | |
| Congressional Adds Subtotals | 96.706 | 0.000 |

C. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

D. Acquisition Strategy

Experimentation campaigns will aid the advancement and transition of advanced technologies by providing the credible evidence decision makers need to make sound strategic decisions and investment choices, to provide the warfighter with advanced capabilities. The Air Force Capability Development Council, Air Force Warfighting Integration Capability, and/or SAF/AQ directs experimentation campaigns. The Air Force Strategic Development Planning and Experimentation office manages and executes each experimentation campaign. Contracting strategies vary based on the activities of each campaign.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|--|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604858F / Tech Transition Program | Project (Number/Name) 645350 / Experimentation |
|--|---|--|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Experimentation Campaigns | C/Various | Various : Various | - | 19.642 | Oct 2018 | 39.230 | Mar 2019 | 74.798 | Mar 2020 | - | | 74.798 | Continuing | Continuing | - |
| Congressional Add - Light Attack Experimentation Ph II | C/FFP | Sierra Nevada Corp : Sparks, NV | - | 3.000 | May 2018 | - | | - | | - | | - | 0.000 | 3.000 | - |
| Congressional Add - Light Attack Experimentation Ph II Contract Award | C/FFP | Textron Aviation Defense : Wichita, KS | - | 3.000 | Jun 2018 | - | | - | | - | | - | 0.000 | 3.000 | - |
| Congressional Add - Light Attack Experimentation | TBD | TBD : TBD | - | 32.000 | Jun 2019 | - | | - | | - | | - | 0.000 | 32.000 | - |
| Congressional Add - Light Attack Experimentation Program Office Standup | Various | Various : Various | - | 20.070 | Jun 2019 | - | | - | | - | | - | 0.000 | 20.070 | - |
| Congressional Add - Light Attack Experimentation Risk Reduction | MIPR | TBD : TBD | - | 10.035 | Jun 2019 | - | | - | | - | | - | 0.000 | 10.035 | - |
| Experimentation Campaign: Commercial Space Internet/Global Lightning | C/Various | Various : Various | - | 11.401 | Jul 2018 | 11.623 | Mar 2019 | - | | - | | - | 0.000 | 23.024 | - |
| Experimentation Campaign - Multi-Domain Command and Control (MDC2) | Various | Various : Various | - | 31.849 | Feb 2019 | - | | - | | - | | - | 0.000 | 31.849 | - |
| Experimentation Campaign - Data To Decision (D2D) | Various | Various : Various | - | 14.327 | Jun 2018 | - | | - | | - | | - | 0.000 | 14.327 | - |
| Experimentation Campaign - Defeat of Agile Intelligent Targets (DAIT) | Various | Various : Various | - | 8.644 | Jan 2019 | - | | - | | - | | - | 0.000 | 8.644 | - |
| Artificial Intelligence for Air Combat | TBD | TBD : TBD | - | 3.000 | Mar 2019 | - | | - | | - | | - | 0.000 | 3.000 | - |
| Subtotal | | | - | 156.968 | | 50.853 | | 74.798 | | - | | 74.798 | Continuing | Continuing | N/A |

Remarks
Further budget details can be provided in the appropriate forum.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|---|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604858F / <i>Tech Transition Program</i> | Project (Number/Name) 645350 / <i>Experimentation</i> |
|--|--|---|

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|---|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Experimentation Campaign: Directed Energy Modeling and Simulation/Wargaming Support | MIPR | AFRL : Kirtland, NM | - | 0.300 | May 2018 | 0.970 | Feb 2019 | - | | - | | - | 0.000 | 1.270 | - |
| Congressional Add - Light Attack Experimentation | MIPR | Aeronet : various | - | 2.455 | Jun 2018 | - | | - | | - | | - | 0.000 | 2.455 | - |
| Congressional Add - Light Attack Experimentation Support | MIPR | DTIC : Ft. Belvoir, VA | - | 1.696 | Jan 2019 | - | | - | | - | | - | 0.000 | 1.696 | - |
| Congressional Add Light Attack Experimentation Program Life Cycle Support | MIPR | GSA : Chicago, IL | - | 4.500 | Aug 2018 | - | | - | | - | | - | 0.000 | 4.500 | - |
| Congressional Add Light Attack Experimentation Training Systems Requirements Analysis | MIPR | GSA : Washington, DC | - | 0.664 | Mar 2019 | - | | - | | - | | - | 0.000 | 0.664 | - |
| Light Attack Experimentation AERO Net Integration | MIPR | AeroNet : Various | - | 1.450 | May 2018 | - | | - | | - | | - | 0.000 | 1.450 | - |
| Experimentation Campaign: Directed Energy Modeling and Simulation Support, Data Analysis and Vignette Support | MIPR | AFRL : WPAFB, OH | - | 1.820 | Mar 2018 | 1.150 | Mar 2019 | - | | - | | - | 0.000 | 2.970 | - |
| Experimentation Campaign Data to Decision Support | Various | Various : Various | - | 2.811 | Jun 2018 | - | | - | | - | | - | 0.000 | 2.811 | - |
| Experimentation Campaign: Multi Domain Command and Control | Various | Various : Various | - | 2.330 | Sep 2018 | - | | - | | - | | - | 0.000 | 2.330 | - |
| Experimentation Campaign Defense of Agile Intelligent Targets | Reqn | Utah State University Res : North Logan, UT | - | 0.200 | Sep 2018 | - | | - | | - | | - | 0.000 | 0.200 | - |

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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|--|--|---|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604858F / <i>Tech Transition Program</i> | Project (Number/Name) 645350 / <i>Experimentation</i> |
|--|--|---|

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---------------------------------|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Experimentation Campaign DAIT | MIPR | GSA : Fairborn, OH | - | 0.565 | Aug 2018 | - | | - | | - | | - | 0.000 | 0.565 | - |
| Subtotal | | | - | 18.791 | | 2.120 | | - | | - | | - | 0.000 | 20.911 | N/A |

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|---------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Directed Energy Experimentation Government Modeling and Test Planning Support | MIPR | AFRL : Kirtland, NM | - | 1.150 | Mar 2018 | 2.500 | Feb 2019 | - | | - | | - | 0.000 | 3.650 | - |
| Congressional Add - Light Attack Experimentation Live Fire Test | PO | 704th Test Group : Holloman, NM | - | 6.430 | Oct 2018 | - | | - | | - | | - | 0.000 | 6.430 | - |
| Congressional Add - Light Attack Experimentation Test Group | MIPR | 704th Test Group : Holloman, NM | - | 0.730 | Nov 2018 | - | | - | | - | | - | 0.000 | 0.730 | - |
| Congressional Add - Light Attack Experimentation Test | Various | Various : Various | - | 1.061 | Sep 2018 | - | | - | | - | | - | 0.000 | 1.061 | - |
| Directed Energy Experimentation Test Support | Various | Various : Various | - | 6.431 | Jun 2018 | 20.020 | Mar 2019 | - | | - | | - | 0.000 | 26.451 | - |
| Commercial Space Internet Government Test | MIPR | Various : Various | - | 0.025 | Sep 2018 | 0.377 | Feb 2019 | - | | - | | - | 0.000 | 0.402 | - |
| Light Attack Experimentation Test | MIPR | Aeronet : Eglin, FL | - | 0.524 | Jun 2018 | - | | - | | - | | - | 0.000 | 0.524 | - |
| Defeat of Agile Intelligent Targets Test | MIPR | Sandia Labs : Washington, DC | - | 0.770 | May 2018 | - | | - | | - | | - | 0.000 | 0.770 | - |
| Subtotal | | | - | 17.121 | | 22.897 | | - | | - | | - | 0.000 | 40.018 | N/A |

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604858F / <i>Tech Transition Program</i> | Project (Number/Name) 645350 / <i>Experimentation</i> |
|--|--|---|

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Congressional Add Light Attack Program Management Administration Costs | Various | Various : Various | - | 5.065 | Sep 2018 | - | | - | | - | | - | 0.000 | 5.065 | - |
| Directed Energy Campaign Program Management Administration Costs | Various | Various : Various | - | 0.300 | Aug 2018 | 0.360 | Aug 2019 | - | | - | | - | 0.000 | 0.660 | - |
| Light Attack Experiment Program Management Experimentation | Various | Various : Various | - | 1.026 | Sep 2018 | - | | - | | - | | - | 0.000 | 1.026 | - |
| Experimentation Campaign Contractor Support | Various | Various : Various | - | - | | 7.700 | Mar 2019 | 4.000 | Mar 2020 | - | | 4.000 | Continuing | Continuing | - |
| Experimentation Campaign Program Management Administration Costs | Various | Various : Various | - | - | | 2.890 | Aug 2019 | 3.000 | Aug 2020 | - | | 3.000 | Continuing | Continuing | - |
| Experimentation Campaign Multi Domain Command Control Program Management Administration | Various | Various : Various | - | 2.421 | Dec 2018 | - | | - | | - | | - | 0.000 | 2.421 | - |
| Experimentation Campaign Data To Decisions | Various | Various : Various | - | 0.662 | Jan 2018 | - | | - | | - | | - | 0.000 | 0.662 | - |
| Experimentation Campaign Defense of Agile Intelligent targets | Various | Various : Various | - | 0.065 | Aug 2018 | - | | - | | - | | - | 0.000 | 0.065 | - |
| Subtotal | | | - | 9.539 | | 10.950 | | 7.000 | | - | | 7.000 | Continuing | Continuing | N/A |

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|
| Project Cost Totals | - | 202.419 | 86.820 | 81.798 | - | 81.798 | Continuing | Continuing | N/A |

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|---|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604858F / <i>Tech Transition Program</i> | Project (Number/Name) 645350 / <i>Experimentation</i> |
|--|--|---|

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
|---|--|
| Experimentation | |
| Experimentation Campaigns | |
| Congressional Add - Light Attack Experimentation | |
| Congressional Add Light Attack Experimentation | |
| Light Attack Experimentation | |
| Light Attack Experimentation Campaign | |
| Multi Domain Command and Control | |
| Multi Domain Command and Control Experiment | |
| Directed Energy Experimentation Campaign | |
| Directed Energy Campaign | |
| Data to Decision | |
| Data to Decisions Experiment | |
| Defeat of Agile Intelligent Targets | |
| Defense of Agile Intelligent Targets Experiments | |
| Commercial Space Internet | |
| Commercial Space Internet Experimentation | |

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|---|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604858F / <i>Tech Transition Program</i> | Project (Number/Name) 645350 / <i>Experimentation</i> |
|--|--|---|

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Experimentation</i> | | | | |
| Experimentation Campaigns | 1 | 2018 | 4 | 2024 |
| <i>Congressional Add - Light Attack Experimentation</i> | | | | |
| Congressional Add Light Attack Experimentation | 3 | 2018 | 4 | 2019 |
| <i>Light Attack Experimentation</i> | | | | |
| Light Attack Experimentation Campaign | 1 | 2018 | 4 | 2019 |
| <i>Multi Domain Command and Control</i> | | | | |
| Multi Domain Command and Control Experiment | 1 | 2018 | 4 | 2019 |
| <i>Directed Energy Experimentation Campaign</i> | | | | |
| Directed Energy Campaign | 1 | 2018 | 4 | 2020 |
| <i>Data to Decision</i> | | | | |
| Data to Decisions Experiment | 1 | 2018 | 4 | 2019 |
| <i>Defeat of Agile Intelligent Targets</i> | | | | |
| Defense of Agile Intelligent Targets Experiments | 1 | 2018 | 4 | 2019 |
| <i>Commercial Space Internet</i> | | | | |
| Commercial Space Internet Experimentation | 2 | 2018 | 4 | 2023 |

Note

Further schedule details regarding individual experimentation campaigns can be provided in the appropriate forum.

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| | | | | | | | | | | | | |
|---|--------------------|----------------|----------------|---------------------|--|----------------------|----------------|----------------|---|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 4 | | | | | R-1 Program Element (Number/Name) PE 0604858F / <i>Tech Transition Program</i> | | | | Project (Number/Name) 645351 / <i>Prototyping</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 645351: <i>Prototyping</i> | - | 877.039 | 80.457 | 46.678 | 26.450 | 73.128 | 198.824 | 176.151 | 73.845 | 0.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

The Prototyping project enables integration and demonstration of emerging technologies in an operational or operational-like environment in order to capitalize on successful research and development efforts with high warfighter priority. Integration and demonstration of prototypes also allow leadership to make informed strategy and resource decisions based on the results of such prototype demonstrations. Prototyping efforts funded in this project capitalize on various emerging warfighter technology areas such as communications, cyber weapons, or novel aircraft technology.

In FY 2019 and beyond, the Adaptive Engine Transition Program effort is reported in PE 0604004F, Advanced Engine Development, the Hypersonics Prototyping efforts for Air Launched Rapid Response Weapon (ARRW) and Hypersonic Conventional Strike Weapon (HCSW) are reported in PE 0604033F, Hypersonics Prototyping, and the Directed Energy Prototyping effort is reported in PE 0604032F, Directed Energy Prototyping. These efforts were transferred as Congressionally directed in the Department of Defense Appropriations Act of 2019 for greater transparency of Air Force prototyping activities.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| Title: Adaptive Engine Transition Program (AETP) | 565.450 | 0.000 | 0.000 | 0.000 | 0.000 |
| Description: AETP will design and manufacture multiple flight-weight adaptive engine prototypes, complete component rig assessments, characterize materials, and inform manufacturing process improvements. By producing flight-weight prototypes, the program will demonstrate adaptive engine technology can be scaled to meet military fighter engine size requirements, while ensuring appropriate manufacturing- and technology-readiness levels. By performing sea-level, altitude, and durability assessments across multiple power settings, the prototype engines will demonstrate fuel efficiency increases, thrust increases, and new component technologies. These assessments will provide data to quantify the capability and reduce risk in areas such as thermal capacity, reliability, and supportability, among others. | | | | | |
| FY 2019 Plans: In FY 2019 and beyond, this effort will be reported in PE 0604004F, Advanced Engine Development, Project 643608, Advanced Engine Development. | | | | | |
| FY 2020 Base Plans: Not Applicable | | | | | |
| FY 2020 OCO Plans: | | | | | |

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|---|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604858F / <i>Tech Transition Program</i> | Project (Number/Name) 645351 / <i>Prototyping</i> |
|--|--|---|

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|---------|---------|--------------|-------------|---------------|
|---|---------|---------|--------------|-------------|---------------|

| | | | | | |
|---|--|--|--|--|--|
| Not Applicable | | | | | |
| <i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> | | | | | |
| Not Applicable | | | | | |

| | | | | | |
|--|---------|--------|--------|--------|--------|
| <p>Title: Lifecycle Prototyping</p> <p>Description: Lifecycle prototyping, product support and sustainment technologies.</p> <p>In FY 2018 Hypersonics Prototyping is included in Lifecycle Prototyping. In FY 2019 and beyond, Hypersonics Prototyping is reported in PE 0604033F, Hypersonics Prototyping, Project 643885, Hypersonic Conventional Strike Weapon (HCSW), and Project 643882, Air-Launched Rapid Response Weapon (ARRW).</p> <p>FY 2019 Plans: Conduct Spectral Halo Pod prototyping effort to enable multi-generation aircraft to employ multiple domain effects to disrupt, degrade, and collapse adversarial targets. Design and manufacture the low-cost attributable aircraft prototype with representative payloads and subsystems. Develop product support and sustainment technologies to support the warfighter and reduce sustainment costs. Initiate space internet prototyping effort to enable broad connectivity across multiple platforms. Additional prototyping activities for emerging technologies may be added based on Department guidance.</p> <p>FY 2020 Base Plans: Continue Spectral Halo Pod prototyping effort to enable multi-generation aircraft to employ multiple domain effects to disrupt, degrade, and collapse adversarial targets. Continue space internet prototyping effort to enable broad connectivity across multiple platforms. Additional prototyping activities for emerging technologies may be based on Department guidance.</p> <p>FY 2020 OCO Plans: Provide forces with persistent overhead intelligence, surveillance and reconnaissance for special operations by replacing prototype airborne Group 4 unmanned aerial systems (UAS) and mission payloads lost through combat attrition in performance of special operations forces operational assessment; and developing and delivering three field-testable persistent (6+ day sortie) systems of aircraft, ground systems, and other equipment for operational evaluation in theater for high value targets. Provide expeditionary system and mobile counter-UAS airborne payload suite integrated with affordable, persistent Group 4 UAS for detection, identification,</p> | 190.635 | 50.457 | 46.678 | 26.450 | 73.128 |
|--|---------|--------|--------|--------|--------|

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|---|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604858F / <i>Tech Transition Program</i> | Project (Number/Name) 645351 / <i>Prototyping</i> |
|--|--|---|

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|---------|---------|--------------|-------------|---------------|
| and defeat of threat small UAS. Provide instant curing fuel leak repair technology for all weapon systems in all theaters. <i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> FY 2020 increased compared to FY 2019 by \$22.671 million. Funding increased due to OCO requests to support instant curing fuel leak repair research and development, persistent overhead surveillance and reconnaissance, and counter unmanned aerial systems prototyping efforts in FY 2020. | | | | | |
| Accomplishments/Planned Programs Subtotals | 756.085 | 50.457 | 46.678 | 26.450 | 73.128 |

| | FY 2018 | FY 2019 |
|---|---------|---------|
| <i>Congressional Add:</i> Program Increase - Competitively Awarded Technology Transition <i>FY 2018 Accomplishments:</i> Conducted Congressionally-directed efforts <i>FY 2019 Plans:</i> Not Applicable | 9.638 | 0.000 |
| <i>Congressional Add:</i> Program Increase - Directed Energy Prototyping <i>FY 2018 Accomplishments:</i> Conducted Congressionally-directed efforts <i>FY 2019 Plans:</i> In FY 2019, this effort is reported in PE 0604032F, Directed Energy Prototyping, Project 640200, DE Prototyping. | 67.464 | 0.000 |
| <i>Congressional Add:</i> Program Increase - Logistics Technologies <i>FY 2018 Accomplishments:</i> Conducted Congressionally-directed efforts <i>FY 2019 Plans:</i> Not Applicable | 9.156 | 0.000 |
| <i>Congressional Add:</i> Program Increase - Alternative Energy Research <i>FY 2018 Accomplishments:</i> Conducted Congressionally-directed efforts <i>FY 2019 Plans:</i> Conduct Congressionally-directed efforts | 5.783 | 5.000 |
| <i>Congressional Add:</i> Program Increase - Assured Positioning Navigation and Timing (PNT) <i>FY 2018 Accomplishments:</i> Conducted Congressionally-directed efforts <i>FY 2019 Plans:</i> Not Applicable | 28.913 | 0.000 |
| <i>Congressional Add:</i> Program Increase - Laser Coating Removal Technology | 0.000 | 10.000 |

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|---|--|---|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604858F / <i>Tech Transition Program</i> | Project (Number/Name) 645351 / <i>Prototyping</i> |

| | FY 2018 | FY 2019 |
|--|---------|---------|
| FY 2018 Accomplishments: Not Applicable | | |
| FY 2019 Plans: Conduct Congressionally-directed efforts | | |
| Congressional Add: Program Increase - Health and Logistics Management Technology | 0.000 | 5.000 |
| FY 2018 Accomplishments: Not Applicable | | |
| FY 2019 Plans: Conduct Congressionally-directed efforts | | |
| Congressional Add: Program Increase - Competitively Awarded Technology Transition Initiatives | 0.000 | 10.000 |
| FY 2018 Accomplishments: Not Applicable | | |
| FY 2019 Plans: Conduct Congressionally-directed efforts | | |
| Congressional Adds Subtotals | 120.954 | 30.000 |

C. Other Program Funding Summary (\$ in Millions)

| Line Item | FY 2018 | FY 2019 | FY 2020 | FY 2020 | FY 2020 | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To | |
|---|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|------------|
| | | | Base | OCO | Total | | | | | Complete | Total Cost |
| • RDTE 04 0604033F: <i>Hypersonics Prototyping</i> | 0.000 | 508.858 | 576.000 | - | 576.000 | 201.200 | 28.500 | 0.000 | 0.000 | 0.000 | 1,314.558 |
| • RDTE 04 0604032F: <i>Directed Energy Prototyping</i> | 0.000 | 50.000 | 10.000 | - | 10.000 | 15.000 | 5.000 | 0.000 | 0.000 | 0.000 | 80.000 |
| • RDTE 04 0604004F: <i>Advanced Engine Development</i> | 0.000 | 720.355 | 878.442 | - | 878.442 | 637.657 | 0.000 | 0.000 | 0.000 | 0.000 | 2,236.454 |

Remarks

In FY 2019 and beyond, Adaptive Engine Transition Program is reported in PE 0604004F, Advanced Engine Development.

In FY 2019 and beyond, Hypersonics Prototyping is reported in PE 0604033F, Hypersonics Prototyping.

In FY 2019 and beyond, Directed Energy Prototyping is reported in PE 0604032F, Directed Energy Prototyping.

D. Acquisition Strategy

For the Adaptive Engine Transition Program (AETP), the Air Force has awarded two limited source, cost plus incentive fee contracts to General Electric and Pratt & Whitney due to their unique qualifications to design a high performance, flight-weight adaptive turbine engine in the thrust class for AETP. Incentive categories include engine weight, performance factors, and maintainability and supportability, with specific metrics for each area incentivized. The government agency responsible for managing this program is the Air Force Life Cycle Management Center, Propulsion Directorate, Wright-Patterson Air Force Base, Ohio.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force Date: February 2019

| | | |
|--|--|---|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604858F / <i>Tech Transition Program</i> | Project (Number/Name) 645351 / <i>Prototyping</i> |
|--|--|---|

For Spectral Halo, the Air Force awarded to existing cost plus type contracts with Herrick Technology Laboratories, Inc (MD), Northeast Information Discovery, Inc (NY), Advanced Geolocation Solutions, Inc (VA), and Mitre, (MA). Follow on contracts planned in 3rd quarter FY 2019 and 2nd quarter FY 2020 to accelerate prototyping.

For Low Cost Attributable Aircraft Technology, the Air Force leveraged the Defense Innovation Unit Experimental Other Transaction Authority to award a Firm Fixed Price Contract to the following contractors: Lockheed Martin, Aurora, Autonodyne, Venator, and Fregata.

Acquisition Decision Memorandum (signed 3 May 2018) designated Air-Launched Rapid Response Weapon (ARRW) as Section 804 Rapid Prototyping Program. The Air Force applied funding to an existing DARPA Other Transaction Authority contract to Lockheed Martin in order to leverage the synergistic efforts ongoing in the Tactical Boost Glide technology demonstration. In August 2018, the Air Force awarded an undefinitized contract in order to complete a critical design review and procure all long lead parts and materials. Upon definitization, the ARRW program will modify the contract to award the entire RDT&E effort (through the end of flight test). The cost type contract includes schedule incentives to earn a higher fixed fee. The government agency responsible for managing this program is the Air Force Life Cycle Management Center, Armament Directorate, Eglin AFB, FL.

Acquisition Decision Memorandum (signed 3 May 2018) designated Hypersonic Conventional Strike Weapon (HCSW) as Section 804 Rapid Prototyping Program. The Air Force awarded in April 2018 an Indefinite Delivery / Indefinite Quantity to Lockheed Martin Corp. - Space for the design, development, engineering, systems integration, test, logistics planning, and aircraft integration support of all the elements of a hypersonic, conventional, air-launched, stand-off weapon. The government agency responsible for managing this program is the Air Force Life Cycle Management Center, Armament Directorate, Eglin AFB, FL.

Acquisition strategies for other prototypes from Congressional adds and OCO funding vary based on the activities of each prototype.

Miscellaneous emerging prototyping will be based on guidance from Department leadership.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|--|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604858F / Tech Transition Program | Project (Number/Name) 645351 / Prototyping |
|--|---|--|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|----------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Adaptive Engine Transition Program - GE | C/CPIF | GE : Evendale, OH | - | 287.510 | Oct 2017 | - | | - | | - | | - | 0.000 | 287.510 | - |
| Adaptive Engine Transition Program - PW | C/CPIF | PW : East Hartford, CT | - | 274.686 | Oct 2017 | - | | - | | - | | - | 0.000 | 274.686 | - |
| Hypersonics Prototyping - ARRW DARPA OTA | SS/FFP | Lockheed Martin : Various | - | 34.995 | Jan 2018 | - | | - | | - | | - | 0.000 | 34.995 | - |
| Hypersonics Prototyping - ARRW Mission Planning | MIPR | Various : TBD | - | 1.555 | Mar 2018 | - | | - | | - | | - | 0.000 | 1.555 | - |
| Hypersonics Prototyping - ARRW AF UCA | SS/CPFF | Lockheed Martin : Various | - | 30.000 | Aug 2018 | - | | - | | - | | - | 0.000 | 30.000 | - |
| Hypersonics Prototyping - HCSW Hypersonic program office support, analysis, technical risk reduction, development and integration | Various | Lockheed Martin : Huntsville, AL | - | 14.016 | May 2018 | - | | - | | - | | - | 0.000 | 14.016 | - |
| Hypersonics Prototyping - HCSW Hypersonic program office support, analysis, technical risk reduction, | Various | Lockheed Martin : Huntsville, AL | - | 5.275 | Jan 2019 | - | | - | | - | | - | 0.000 | 5.275 | - |
| Spectral Halo Pod Prototyping | C/CPFF | Various : Rome, NY | - | 47.132 | Jul 2018 | 26.000 | Apr 2019 | 25.650 | Apr 2020 | - | | 25.650 | Continuing | Continuing | - |
| Low-Cost Attributable Aircraft Technology Prototyping | Various | Various : Various | - | 11.740 | Jan 2018 | 12.319 | Jan 2019 | - | | - | | - | 0.000 | 24.059 | - |
| Commercial Space Internet Prototyping | C/FFP | Space X : Hawthorne, CA | - | 0.000 | | 12.138 | Jan 2019 | 21.028 | Jan 2020 | - | | 21.028 | Continuing | Continuing | - |
| Congressional Add - Competitively Awarded Technology Transition | Reqn | Various : Various | - | 9.638 | Jan 2019 | - | | - | | - | | - | 0.000 | 9.638 | - |
| Congressional Add - Alternate Energy Reserach | Various | Various : Various | - | 5.783 | Apr 2019 | 5.000 | Sep 2019 | - | | - | | - | 0.000 | 10.783 | - |
| Congressional Add - Assured PNT | Various | Various : Various | - | 28.913 | Aug 2018 | - | | - | | - | | - | 0.000 | 28.913 | - |

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604858F / <i>Tech Transition Program</i> | Project (Number/Name) 645351 / <i>Prototyping</i> |
|--|--|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Congressional Add - Logistics Technologies | Various | Various : Various | - | 9.156 | Mar 2019 | - | | - | | - | | - | 0.000 | 9.156 | - |
| Congressional Add Directed Energy Prototyping | Various | Various : Various | - | 61.464 | Jun 2019 | - | | - | | - | | - | 0.000 | 61.464 | - |
| Congressional Add Laser Coating Removal Technology | Various | Various : Various | - | - | | 10.000 | Feb 2019 | - | | - | | - | 0.000 | 10.000 | - |
| Congressional Add Health and Logistics Management Technology | Various | Various : Various | - | - | | 5.000 | Feb 2019 | - | | - | | - | 0.000 | 5.000 | - |
| Congressional Add Competitively Awarded Technology Transition Initiatives | Various | Various : Various | - | - | | 10.000 | Jul 2019 | - | | - | | - | 0.000 | 10.000 | - |
| Mobile Counter-UAS Airborne Payload Suite | C/CPAF | TBD : TBD | - | - | | - | | 0.000 | | 7.800 | | 7.800 | 0.000 | 7.800 | - |
| Integrated Expeditionary Counter-Unmanned Aerial System | C/CPAF | TBD : TBD | - | - | | - | | 0.000 | | 2.000 | | 2.000 | 0.000 | 2.000 | - |
| Persistent Overhead Surveillance/ Reconnaissance for Special Operations | TBD | TBD : TBD | - | - | | - | | 0.000 | | 10.300 | | 10.300 | 0.000 | 10.300 | - |
| Overhead Surveillance/ Reconnaissance for Special Operations | TBD | TBD : TBD | - | - | | - | | 0.000 | | 5.600 | | 5.600 | 0.000 | 5.600 | - |
| Instant Fuel Leak Repair | TBD | TBD : TBD | - | - | | - | | 0.000 | | 0.750 | | 0.750 | 0.000 | 0.750 | - |
| Subtotal | | | - | 821.863 | | 80.457 | | 46.678 | | 26.450 | | 73.128 | Continuing | Continuing | N/A |

Remarks
 In FY 2019 and beyond, Adaptive Engine Transition Program is reported in PE 0604004F, Advanced Engine Development.
 In FY 2019 and beyond, Hypersonics Prototyping is reported in PE 0604033F, Hypersonics Prototyping.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604858F / Tech Transition Program | Project (Number/Name) 645351 / Prototyping |
|--|---|--|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |

In FY 2019 and beyond, Directed Energy Prototyping is reported in PE 0604032F, Directed Energy Prototyping.

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Hypersonics Prototyping - ARRW Aircraft Integration | Various | Various : TBD | - | 3.332 | Jan 2018 | - | | - | | - | | - | 0.000 | 3.332 | - |
| Hypersonics Prototyping - ARRW Logistics Support and Analysis | Various | Various : TBD | - | 1.318 | Oct 2017 | - | | - | | - | | - | 0.000 | 1.318 | - |
| Hypersonic Prototyping - HCSW Development and Prototyping Support | Various | Various : TBD | - | 13.054 | Sep 2018 | - | | - | | - | | - | 0.000 | 13.054 | - |
| Hypersonic Prototyping - HCSW Long Lead Items | Various | Various : TBD | - | 5.178 | Jan 2019 | - | | - | | - | | - | 0.000 | 5.178 | - |
| Congressional Add - Directed Energy Prototyping Support | Various | Various : TBD | - | 1.820 | Jul 2018 | - | | - | | - | | - | 0.000 | 1.820 | - |
| Subtotal | | | - | 24.702 | | - | | - | | - | | - | 0.000 | 24.702 | N/A |

Remarks

In FY 2019 and beyond, Hypersonics Prototyping is reported in PE 0604033F, Hypersonics Prototyping.

In FY 2019 and beyond, Directed Energy Prototyping is reported in PE 0604032F, Directed Energy Prototyping.

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Hypersonics Prototyping - ARRW Government Test | C/Various | Multiple : TBD | - | 9.142 | Dec 2018 | - | | - | | - | | - | 0.000 | 9.142 | - |
| Hypersonics Prototyping - HCSW Government | Various | 96 TW : Eglin AFB, FL | - | 7.859 | Feb 2019 | - | | - | | - | | - | 0.000 | 7.859 | - |

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604858F / Tech Transition Program | Project (Number/Name) 645351 / Prototyping |
|--|---|--|

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| test support . Includes flight test equipment, targets, 96 Test Wing and range support, and aircraft integration test. | | | | | | | | | | | | | | | |
| Congressional Add Directed Energy Prototyping Test | MIPR | WSMR : White Sands, NM | - | 1.000 | Aug 2018 | - | | - | | - | | - | 0.000 | 1.000 | - |
| Subtotal | | | - | 18.001 | | - | | - | | - | | - | 0.000 | 18.001 | N/A |

Remarks
 In FY 2019 and beyond, Hypersonics Prototyping is reported in PE 0604033F, Hypersonics Prototyping.
 In FY 2019 and beyond, Directed Energy Prototyping is reported in PE 0604032F, Directed Energy Prototyping.

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Adaptive Engine Transition Program Program Management Support | Various | Various : TBD | - | 3.254 | Oct 2017 | - | | - | | - | | - | 0.000 | 3.254 | - |
| Hypersonics Prototyping - ARRW Program Management Administration | C/Various | Not specified. : TBD | - | 2.239 | Nov 2018 | - | | - | | - | | - | 0.000 | 2.239 | - |
| Hypersonics Prototyping - HCSW Program Management Administration | Various | Various : TBD | - | 3.800 | Aug 2018 | - | | - | | - | | - | 0.000 | 3.800 | - |
| Congressional Add - Directed Energy Prototyping Management Administration | Various | Various : TBD | - | 3.180 | Jan 2019 | - | | - | | - | | - | 0.000 | 3.180 | - |
| Subtotal | | | - | 12.473 | | - | | - | | - | | - | 0.000 | 12.473 | N/A |

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604858F / <i>Tech Transition Program</i> | Project (Number/Name) 645351 / <i>Prototyping</i> |
|--|--|---|

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--------------------------------------|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |

Remarks
 Hypersonics Prototyping - Includes A&AS support requirements plus TDY, office and office supplies. FY 2018 is not full support staff. FY 2019 is full staffing.
 In FY 2019 and beyond, Adaptive Engine Transition Program is reported in PE 0604004F, Advanced Engine Development.
 In FY 2019 and beyond, Hypersonics Prototyping is reported in PE 0604033F, Hypersonics Prototyping.
 In FY 2019 and beyond, Directed Energy Prototyping is reported in PE 0604032F, Directed Energy Prototyping.

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|
| Project Cost Totals | - | 877.039 | 80.457 | 46.678 | 26.450 | 73.128 | Continuing | Continuing | N/A |

Remarks
 Additional details, including Adaptive Engine, Spectral Halo, low-cost attributable aircraft technology, space internet prototyping, Hypersonics, Directed Energy, and other emerging prototyping efforts, can be provided in the appropriate forum.

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force **Date:** February 2019

| | | |
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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604858F / <i>Tech Transition Program</i> | Project (Number/Name) 645351 / <i>Prototyping</i> |
|--|--|---|

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|--|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| <i>Lifecycle Prototyping</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Spectral Halo Pod | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Low-Cost Attributable Aircraft Technology (LCAAT) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Space Internet | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Congressional Add - Directed Energy Prototyping | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Congressional Add - Alternative Energy Research | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Congressional Add - Assured PNT | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Congressional Add - Competitively Awarded Technology Transition | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Congressional Add - Logistics Technologies | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Congressional Add - Laser Coating Removal Technology | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Congressional Add - Health and Logistics Management Technology | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Congressional Add - Competitively Awarded Technology Transition Initiatives | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OCO - Mobile Counter-UAS Airborne Payload Suite | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OCO - Integrated Expeditionary Counter Unmanned Aerial System | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OCO - Persistent Overhead Surveillance/ Reconnaissance for Special Operations | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OCO - Overhead Surveillance/ Reconnaissance for Special Operations | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|---|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604858F / <i>Tech Transition Program</i> | Project (Number/Name) 645351 / <i>Prototyping</i> |
|--|--|---|

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Lifecycle Prototyping</i> | | | | |
| Spectral Halo Pod | 1 | 2018 | 4 | 2020 |
| Low-Cost Attributable Aircraft Technology (LCAAT) | 1 | 2018 | 4 | 2019 |
| Space Internet | 1 | 2019 | 4 | 2023 |
| Congressional Add - Directed Energy Prototyping | 2 | 2018 | 4 | 2018 |
| Congressional Add - Alternative Energy Research | 2 | 2018 | 4 | 2019 |
| Congressional Add - Assured PNT | 2 | 2018 | 4 | 2018 |
| Congressional Add - Competitively Awarded Technology Transition | 2 | 2018 | 4 | 2018 |
| Congressional Add - Logistics Technologies | 2 | 2018 | 4 | 2018 |
| Congressional Add - Laser Coating Removal Technology | 1 | 2019 | 4 | 2019 |
| Congressional Add - Health and Logistics Management Technology | 1 | 2019 | 4 | 2019 |
| Congressional Add - Competitively Awarded Technology Transition Initiatives | 1 | 2019 | 4 | 2019 |
| OCO - Mobile Counter-UAS Airborne Payload Suite | 1 | 2020 | 4 | 2020 |
| OCO - Integrated Expeditionary Counter Unmanned Aerial System | 1 | 2020 | 4 | 2020 |
| OCO - Persistent Overhead Surveillance/Reconnaissance for Special Operations | 1 | 2020 | 4 | 2020 |
| OCO - Overhead Surveillance/Reconnaissance for Special Operations | 1 | 2020 | 4 | 2020 |
| OCO - Instant Curing Fuel Leak Repair Technology | 1 | 2020 | 4 | 2020 |
| Emerging Prototypes as directed | 1 | 2018 | 4 | 2024 |
| <i>Hypersonics Prototyping</i> | | | | |
| ARRW - DARPA OTA Option 1 | 1 | 2018 | 4 | 2018 |
| ARRW - AF UCA Lockheed Martin | 4 | 2018 | 4 | 2018 |
| HCSW - Mission Planning/Program Office Support | 1 | 2018 | 4 | 2018 |
| HCSW - Preliminary Design Review | 2 | 2018 | 4 | 2018 |

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|---|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0604858F / <i>Tech Transition Program</i> | Project (Number/Name) 645351 / <i>Prototyping</i> |
|--|--|---|

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Adaptive Engine Transition Program</i> | | | | |
| Detailed Design, Engine Fabrication, Engine Assessment | 1 | 2018 | 4 | 2018 |

Note

In FY 2019 and beyond, Adaptive Engine Transition Program is reported in PE 0604004F, Advanced Engine Development.

In FY 2019 and beyond, Hypersonics Prototyping is reported in PE 0604033F, Hypersonics Prototyping.

In FY 2019 and beyond, Directed Energy Prototyping is reported in PE 0604032F, Directed Energy Prototyping.

The Adaptive Engine Transition Program consists of three phases: detailed design, engine fabrication, and engine assessments. Program deliverables include: military adaptive engine detailed design parameters and models, multiple engine sets of hardware (plus spare parts), matured technologies, major rig assessment data (controls, combustor, etc.), program reviews, and technology, affordability and sustainability studies.

Additional details, including Adaptive Engine, Spectral Halo, low-cost attritable aircraft technology, space internet prototyping, Hypersonics, Directed Energy, OCO, and other emerging prototyping efforts, can be provided in the appropriate forum.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0605230F / <i>Ground Based Strategic Deterrent</i> |
|--|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|--|-------------|---------|---------|--------------|-------------|---------------|-----------|-----------|-----------|-----------|------------------|------------|
| Total Program Element | 252.633 | 221.536 | 414.441 | 570.373 | 0.000 | 570.373 | 1,527.545 | 2,540.300 | 3,039.900 | 3,078.800 | 10,328.079 | 21,973.607 |
| 641025: <i>GROUND BASED STRATEGIC DETERRENT (GBSD)</i> | 252.633 | 221.536 | 414.441 | 570.373 | 0.000 | 570.373 | 1,527.545 | 2,540.300 | 3,039.900 | 3,078.800 | 10,328.079 | 21,973.607 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | - | - |

Program MDAP/MAIS Code: 493

A. Mission Description and Budget Item Justification

The Ground Based Strategic Deterrent (GBSD) will design, develop, produce and deploy a replacement for the current Minuteman III (MM III) Intercontinental Ballistic Missile (ICBM) weapon system. The GBSD program will deliver a fully integrated weapon system beginning in FY29 to close key capability gaps and vulnerabilities identified in the GBSD Capabilities Based Assessment, GBSD Capabilities Development Document, and the GBSD Analysis of Alternatives. GBSD will also mitigate ground-based deterrent degradation due to MM III component age-out and attrition.

The GBSD program will include prime contractor development of applicable support equipment, data, flight test hardware and infrastructure, and training material while examining and mitigating risk during the MM III to GBSD transition. This program includes any needed nuclear surety and certification and system vulnerability assessments. The major activities in the GBSD program include 1) government system engineering, analytics, and test capability development; 2) air vehicle equipment risk reduction; 3) command & launch risk reduction; 4) launch systems risk reduction; and 5) weapon system integration risk reduction. Government systems engineering investments include development of a model based systems engineering (MBSE), integration, test software, product life-cycle management framework, and modernization of existing system engineering labs and infrastructure. Air vehicle equipment is an integrated missile stack which includes the propulsion, post-boost, guidance, and re-entry systems sub-components. Command & launch encompasses all command and control components and interfaces, associated ground hardware, ground control equipment and associated software directly related to the survivability, monitoring, and launch of the replacement flight system. Launch systems include launch control center, launch facility restoration, modernization of real property, and structures and associated ground mechanical systems. Weapon system integration risk reduction includes non-proprietary open systems architecture with well-defined interfaces and a modular design at the weapon system level to allow future modification and technology insertion. Major sub-system support systems include operator and maintenance trainer hardware and software, security system architecture, and transport support equipment.

This program element includes necessary civilian pay expenses required to manage, execute, and deliver GBSD weapon system capability. The use of such program funds is in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, 0605833F, and 0605898F.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0605230F / <i>Ground Based Strategic Deterrent</i> |
|--|---|

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 215.721 | 345.041 | 570.373 | 0.000 | 570.373 |
| Current President's Budget | 221.536 | 414.441 | 570.373 | 0.000 | 570.373 |
| Total Adjustments | 5.815 | 69.400 | 0.000 | 0.000 | 0.000 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 69.400 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 10.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -4.185 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Congressional Add Details (\$ in Millions, and Includes General Reductions)

Project: 641025: *GROUND BASED STRATEGIC DETERRENT (GBSD)*

Congressional Add: *GBSD*

Congressional Add Subtotals for Project: 641025

Congressional Add Totals for all Projects

| | FY 2018 | FY 2019 |
|--|----------------|----------------|
| | 0.000 | 69.400 |
| | 0.000 | 69.400 |
| | 0.000 | 69.400 |

Change Summary Explanation

FY 2018 funding reflects a below threshold reprogramming of \$10.000 million from PE 0101125F and PE 0604933F and an Federally Funded Research and Development Center (FFRDC) adjustment of \$4.185 million.

FY 2019 funding reflects a Congressional add of \$69.400 million for "program increase- unfunded requirement."

C. Accomplishments/Planned Programs (\$ in Millions)

Title: Technology Maturation Risk Reduction

| FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|----------------|----------------|---------------------|--------------------|----------------------|
| 221.536 | 345.041 | 461.705 | - | 461.705 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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|--|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0605230F / <i>Ground Based Strategic Deterrent</i> |
|--|---|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|---------|---------|--------------|-------------|---------------|
|---|---------|---------|--------------|-------------|---------------|

Description: The objectives of TMRR for GBSD are 1) advance GBSD major activities, systems engineering activities, trade-studies, information technology, data management, analytical capabilities and deliver a modular, integrated weapon system preliminary design; and 2) mature technologies related to the major activities and demonstrate performance of sub-system capabilities through prototyping, modeling, and simulation.

- FY 2019 Plans:**
- Complete System Functional Review, cost capability trade studies, and validate Capability Development Document.
 - Use MBSE approach to document and mature design decisions, and develop a strategy to own the technical baseline including data, personnel, analytical tools and information systems infrastructure, and technical processes.
 - Expand the TMRR analytic environment and labs to enable full execution of the program's capability to own the technical baseline throughout the program life cycle.
 - Modify and expand GBSD workspace infrastructure to accommodate a growing workforce.
 - Continue to examine and mature air vehicle equipment, command & launch, cybersecurity, and associated ground technologies, define requirements and modular architectures through trade studies, prototyping, demonstration, and analysis.
 - Continue to mature and refine software integration and modular system architecture requirements.
 - Continue to mature the assessment of the current MM III launch systems to determine, through onsite assessments and analysis, the extent of degradation and evaluate for future upgrade, replacement, preparation, and modernization of operational and test facilities.
 - Continue to mature the weapon system preliminary design and reduce integration risk by conducting trade studies, system engineering, test activities, and system modeling and simulation.
 - Continue to develop analytical, information technology, and data management capabilities to ensure weapon system design information dissemination between contractors.
 - Continue to assess fielding requirements for air vehicle equipment, command & launch, launch systems, operator and maintenance trainer hardware and software, security system architecture, and transport sub-systems and appropriate timelines to transition from MM III to GBSD solution.
 - Expand and develop analytical, information technology, test, and data management capabilities to ensure access to weapon system design information is properly controlled, and information is securely transmitted between the government, TMRR prime contractors, support contractors, and FFRDC/UARCs.

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0605230F / <i>Ground Based Strategic Deterrent</i> |
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C. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|--|---------|---------|-----------------|----------------|------------------|
| <ul style="list-style-type: none"> • Prepare for Request for Proposal Decision Point by further planning for EMD and refining the acquisition strategy based on TMRR assessments. • Increase FFRDC support in order to maintain ownership of the technical baseline in EMD. • Continue to refine Security Classification Guide, update impacts, and implement updates and changes through all Government and contractor programmatic activities. <p><i>FY 2020 Base Plans:</i></p> <ul style="list-style-type: none"> • Modify, modernize, and expand the analytic environment and labs to support the conclusion of TMRR and the transition to EMD activities to enable full execution of the program's capability to own the technical baseline throughout the program life cycle. • Continue to examine and mature air vehicle equipment, command & launch, cybersecurity, operator and maintenance trainer hardware and software, security system architecture, transport sub-systems, and associated ground technologies, define requirements and modular architectures through trade studies, prototyping, demonstration, and analysis. • Continue to mature and refine test software, software development integration and modular system architecture requirements, and product life-cycle management. • Continue to mature the assessment of the current MM III launch systems to determine, through on-site assessments and analysis, the extent of degradation and evaluate for future upgrade, replacement, preparation, and modernization of operational and test facilities. • Continue to mature the weapon system preliminary design and reduce integration risk by conducting trade studies, system engineering, test activities, and system modeling and simulation. • Continue to further develop analytical, information technology, and data management capabilities to ensure weapon system design information dissemination between contractors. • Implement information systems and information technology design to support TMRR closure. • Modify and expand GBSD workspace infrastructure to accommodate a growing workforce. • Continue to assess fielding requirements for air vehicle equipment, command & launch, and launch systems and appropriate timelines to transition from MM III to GBSD solution. • Conduct planning for the use of MBSE tools during Operations and Sustainment phase in order to transform ICBM sustainment and supply chain management. • Complete Software Specification Review, 9th Quarter Technical Interchange Meeting, and the Preliminary Design Review. • Continue to develop system safety and nuclear surety. | | | | | |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0605230F / <i>Ground Based Strategic Deterrent</i> |
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| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|---------|---------|--------------|-------------|---------------|
|---|---------|---------|--------------|-------------|---------------|

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|---|--|--|--|--|--|
| <ul style="list-style-type: none"> • Expand and develop analytical, information technology, test, and data management capabilities to ensure access to weapon system design information is properly controlled and securely transmitted between government and contractors. • Increase FFRDC support to maintain the ability to own the technical baseline. • Prepare to execute based on TMRR assessments by conducting mock source selection activities and exercising the computer and analytic environment for source selection evaluation activities. • Conduct source selection to competitively award and execute EMD contract. • Continue to refine Security Classification Guide, update impacts, and implement updates and changes through all Government and contractor programmatic activities. <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> Funding increase due to ramp-up and completion of Preliminary Design Review and preparation for EMD phase in FY 2020.</p> | | | | | |
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|--|-------|-------|---------|-------|---------|
| <p><i>Title:</i> Engineering & Manufacturing Development</p> <p><i>Description:</i> The objectives of EMD for GBSD are as follows: 1) advance GBSD major activities, systems engineering activities, information technology, data management, analytical capabilities and deliver a flexible, integrated weapon system critical design, 2) prototype and test mature technologies related to the major activities and demonstrate performance of sub-system and system capabilities through prototyping and testing and 3) engage in rapid prototyping events to mature future design increments.</p> <p><i>FY 2019 Plans:</i> N/A</p> <p><i>FY 2020 Base Plans:</i></p> <ul style="list-style-type: none"> • Modify, modernize, and expand the analytic environment and labs to support EMD activities to enable full execution of the program's capability to own the technical baseline throughout the program life cycle. • Continue to examine and mature air vehicle equipment, command & launch, cybersecurity, operator and maintenance trainer hardware and software, security system architecture, transport sub-systems, and associated ground technologies, define requirements and modular architectures through trade studies, prototyping, demonstration, and analysis. • Continue to mature and refine test software, software development integration and modular system architecture requirements, and product life-cycle management. | 0.000 | 0.000 | 108.668 | 0.000 | 108.668 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0605230F / <i>Ground Based Strategic Deterrent</i> |
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| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|--|---------|---------|--------------|-------------|---------------|
| <ul style="list-style-type: none"> • Continue to mature the assessment of the current MM III launch systems to determine, through onsite assessments and analysis, the extent of degradation and evaluate for future upgrade, replacement, preparation, and modernization of operational and test facilities. • Continue to mature the weapon system by conducting trade studies, system engineering, test activities, and system modeling and simulation. • Continue to further develop analytical, information technology, and data management capabilities. • Implement information systems and information technology design to support EMD execution. • Modify and expand GBSD workspace infrastructure to accommodate a growing workforce. • Continue to assess fielding requirements for air vehicle equipment, command & launch, and launch systems and appropriate timelines to transition from MM III to GBSD solution. • Conduct planning for the use of MBSE tools during Operations and Sustainment phase in order to transform ICBM sustainment and supply chain management. • Continue to develop system safety and nuclear surety. • Expand and develop analytical, information technology, test, and data management capabilities to ensure access to weapon system design information is properly controlled and securely transmitted between government and contractors. • Increase FFRDC support to maintain the ability to own the technical baseline in EMD. • Conduct source selection to competitively award and execute EMD contract. • Continue to refine Security Classification Guide, update impacts, and implement updates and changes through all Government and contractor programmatic activities. <p>FY 2020 OCO Plans: No OCO requirements</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding increase due to ramp-up and completion of Preliminary Design Review and preparation for EMD phase in FY 2020.</p> | | | | | |
| Accomplishments/Planned Programs Subtotals | 221.536 | 345.041 | 570.373 | 0.000 | 570.373 |

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|--------------------------------|---------|---------|--|--|--|
| Congressional Add: GBSD | FY 2018 | FY 2019 | | | |
| | 0.000 | 69.400 | | | |

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|---|----------------|----------------|
| | FY 2018 | FY 2019 |
| FY 2018 Accomplishments: N/A | | |
| FY 2019 Plans: • Further modify and expand GBSD workspace infrastructure to accommodate a growing workforce. • Continue to mature the assessment of the current MM III test launch facilities and begin modifications to prepare for EMD. • Continue to mature the reentry vehicle preliminary design and reduce integration risk. • Continue to refine Security Classification Guide, update impacts, and implement updates and changes through all Government and contractor programmatic activities. | | |
| Congressional Adds Subtotals | 0.000 | 69.400 |

D. Other Program Funding Summary (\$ in Millions)

| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> <u>Base</u> | <u>FY 2020</u> <u>OCO</u> | <u>FY 2020</u> <u>Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To</u> <u>Complete</u> | <u>Total Cost</u> |
|---|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|
| • RDTE 04 PE 0603851F: <i>Intercontinental Ballistic Missile - Dem/Val</i> | 27.424 | 32.356 | 44.109 | - | 44.109 | 65.582 | 66.944 | 68.165 | 9.896 | Continuing | Continuing |
| • MILCON PE 0101233F: <i>GBSD SQUADRONS</i> | 0.000 | 0.000 | 108.000 | - | 108.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 108.000 |
| • MILCON PE 0605230F: <i>Ground Based Strategic Deterrent (GBSD)</i> | - | - | 0.000 | - | 0.000 | 151.000 | 140.000 | 117.500 | 74.309 | 127.401 | 610.210 |

Remarks

E. Acquisition Strategy

The objective of the GBSD program strategy is to deliver a full, integrated weapon system capability that meets Air Force Global Strike Command's Capability Development Document requirements beginning in FY29. For the TMRR phase of this strategy, the Program Office competitively awarded two contracts in FY17. The objectives of TMRR for GBSD are as follows: 1) to deliver low-risk, technologically mature, integrated weapon system preliminary design; 2) incorporate a modular open systems architecture; 3) perform cost-capability analysis to aid with validation of user requirements; 4) demonstrate performance of sub-system capabilities through prototyping, modeling, and simulation. The TMRR phase will include a System Requirements Review, System Functional Review, Software Specification Review, and will culminate in a system Preliminary Design Review. The contractor may elect to perform additional risk reduction testing on select components to further evolve the Preliminary Design Review design during TMRR to lower component integration risk during EMD. The period of performance for the TMRR contracts is 4QFY17 to 4QFY20. After Milestone B approval, EMD contract will be competitively awarded in FY20 and EMD execution will begin.

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| Appropriation/Budget Activity | R-1 Program Element (Number/Name) |
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| 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | PE 0605230F / <i>Ground Based Strategic Deterrent</i> |

F. Performance Metrics
Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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| Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force | | | | | | | | | | | Date: February 2019 | | | | |
| Appropriation/Budget Activity 3600 / 4 | | | | R-1 Program Element (Number/Name) PE 0605230F / Ground Based Strategic Deterrent | | | | Project (Number/Name) 641025 / GROUND BASED STRATEGIC DETERRENT (GBSD) | | | | | | | |

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|-----------------------------------|--|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| GBSD TMRR Contractor #1 | C/CPFF | Boeing Def, Space, & Sec : Huntsville, AL | 54.206 | 55.611 | Nov 2017 | 116.168 | Oct 2018 | 123.175 | Oct 2019 | - | | 123.175 | 0.000 | 349.160 | 349.160 |
| GBSD TMRR Contractor #2 | C/CPFF | Northrup Grumman Sys Corp : El Segundo, CA | 61.917 | 67.965 | Nov 2017 | 110.315 | Oct 2018 | 88.388 | Oct 2019 | - | | 88.388 | 0.000 | 328.585 | 328.585 |
| GBSD EMD Contract | C/Various | TBD : TBD | 0.000 | - | | - | | 108.668 | Jul 2020 | - | | 108.668 | 15,829.150 | 15,937.818 | - |
| GBSD Security Classification Guide Compliance | Various | Various : Various | 0.000 | - | | 43.979 | Oct 2018 | 42.414 | Oct 2019 | - | | 42.414 | 0.000 | 86.393 | 86.393 |
| Subtotal | | | 116.123 | 123.576 | | 270.462 | | 362.645 | | - | | 362.645 | 15,829.150 | 16,701.956 | N/A |

Remarks

The GBSD Security Classification Guide (SCG) was implemented in February 2018.
Product Development "Prior Years" total increase due to receipt of FY17 reprogrammed funds.

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| GBSD Integration Support Contract | C/FFP | BAE : Hill AFB, UT | 49.013 | 27.462 | Oct 2017 | 24.570 | Oct 2018 | 31.980 | Oct 2019 | - | | 31.980 | 88.862 | 221.887 | - |
| GBSD Electronic Parts Strategy and Commonality | MIPR | Naval Surface Warfare Center Crane : Crane, IN | 7.074 | 1.669 | Dec 2017 | 3.500 | Nov 2018 | 4.000 | Nov 2019 | - | | 4.000 | 16.800 | 33.043 | - |
| GBSD System Engineering and Acquisition Support | MIPR | Aerospace Corporation : El Segundo, CA | 3.812 | 4.424 | Oct 2017 | 5.688 | Nov 2018 | 6.318 | Nov 2019 | - | | 6.318 | 27.225 | 47.467 | - |
| GBSD Acquisition Support and System Engineering | MIPR | MITRE : Bedford, MA | 4.604 | 5.298 | Oct 2017 | 6.722 | Nov 2018 | 6.922 | Nov 2019 | - | | 6.922 | 23.172 | 46.718 | - |
| GBSD Technical Area Task Support (TMRR) | MIPR | Air Force Global Strike Command : Barksdale AFB, LA | 2.950 | - | | - | | - | | - | | - | 0.000 | 2.950 | - |

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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0605230F / Ground Based Strategic Deterrent | Project (Number/Name) 641025 / GROUND BASED STRATEGIC DETERRENT (GBSD) |
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| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|--|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| GBSD Software Engineering Institute | MIPR | Carnegie Mellon : Pittsburgh, PA | 1.601 | - | | 1.400 | Nov 2018 | 1.402 | Nov 2019 | - | | 1.402 | 8.911 | 13.314 | - |
| GBSD Reentry Systems (RS) FFRDC Support and Analysis | MIPR | Sandia National Laboratories : Various | 8.443 | 3.870 | Nov 2017 | 9.054 | Oct 2018 | 7.750 | Oct 2019 | - | | 7.750 | 41.000 | 70.117 | - |
| GBSD RS FFRDC Analysis and Acquisition Intelligence Support | MIPR | MIT Lincoln Labs : Lexington, MA | 0.580 | 0.848 | Oct 2017 | 1.775 | Oct 2018 | 1.026 | Oct 2019 | - | | 1.026 | 28.125 | 32.354 | - |
| GBSD Operations Research Analyst Support | C/FFP | Tecolote Research : Hill AFB, UT | 0.000 | 0.239 | Jun 2018 | 1.904 | Oct 2018 | 2.230 | Oct 2019 | - | | 2.230 | 6.679 | 11.052 | - |
| GBSD Surety and Certification Engineering Services | C/CPFF | Booz Allen Hamilton : Kirtland AFB, NM | 2.610 | 1.641 | Apr 2018 | 3.930 | Nov 2018 | 1.246 | Nov 2019 | - | | 1.246 | 0.794 | 10.221 | - |
| GBSD OASIS A&AS Support | C/FPIF | Peerless : Hill AFB, UT | 0.000 | 0.025 | Oct 2018 | 0.943 | Nov 2018 | 1.144 | Nov 2019 | - | | 1.144 | 2.179 | 4.291 | - |
| GBSD Temporary Facility | C/FFP | BOXX Modular : Hill AFB, UT | 0.000 | 3.696 | Jul 2018 | 1.585 | Oct 2018 | - | | - | | - | 0.000 | 5.281 | - |
| GBSD Technical Design Agent for NC2 Codes/ Crypto | MIPR | Sandia National Labs : Various | 0.000 | - | | - | | 8.000 | Nov 2019 | - | | 8.000 | 18.000 | 26.000 | - |
| GBSD Joint Test Assembly Encryption | MIPR | Sandia National Labs : Various | 0.000 | - | | - | | 3.000 | Nov 2019 | - | | 3.000 | 6.000 | 9.000 | - |
| GBSD Joint Environment Test Unit / Joint Test Assembly National Nuclear Security Agency Cost Share | MIPR | Sandia National Labs : Various | 0.000 | - | | - | | 2.000 | Nov 2019 | - | | 2.000 | 5.000 | 7.000 | - |
| GBSD Enterprise Support | C/Various | Various : Various | 0.952 | 0.203 | Oct 2017 | 0.048 | Oct 2018 | 0.050 | Oct 2019 | - | | 0.050 | 897.153 | 898.406 | - |
| Subtotal | | | 81.639 | 49.375 | | 61.119 | | 77.068 | | - | | 77.068 | 1,169.900 | 1,439.101 | N/A |

Remarks
 GBSD is spearheading the Owning The Technical Baseline (OTTB) approach for system acquisition. This approach utilizes additional support efforts that would typically be performed by a Prime Contractor.
 GBSD Enterprise Support was labelled GBSD EMD Support in FY19 PB.

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| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---------------------------------|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |

GBSD Electronic Parts Strategy and Commonality, GBSD System Engineering and Acquisition Support, and GBSD Acquisition Support and System Engineering have increased STE since the FY19 PB.
 GBSD Reentry Systems (RS) FFRDC Support and Analysis will continue into EMD.
 GBSD Codes and Crypto designs and develops a certified Nuclear Command and Control cryptographic device using a Technical Design Agent (TDA).

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |

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|--|------|--|-------|-------|----------|-------|----------|--------|----------|---|--|--------|---------|---------|---|
| GBSD Cybersecurity, Test and Evaluation Framework, Codes/Crypto | MIPR | Johns Hopkins University-Applied Physics Lab : Laurel, MD | 6.776 | 5.373 | Jan 2018 | 7.436 | Oct 2018 | 11.352 | Oct 2019 | - | | 11.352 | 10.610 | 41.547 | - |
| GBSD Integrated Test Team | PO | Arnold Engineering Development Complex : Arnold AFB, TN | 2.340 | 2.789 | Oct 2017 | 5.661 | Oct 2018 | 7.462 | Oct 2019 | - | | 7.462 | 6.137 | 24.389 | - |
| GBSD Independent Operational Test Agency | PO | Air Force Operational Test and Evaluation Center : Hill AFB, UT | 0.773 | 0.502 | Jan 2018 | 1.188 | Oct 2018 | 1.990 | Oct 2019 | - | | 1.990 | 214.887 | 219.340 | - |
| GBSD Integrated Threat Analysis and Simulation Environment (ITASE) 1 | MIPR | DIA-Missile and Space Intelligence Center : Redstone Arsenal, AL | 2.400 | 2.282 | Jan 2018 | 4.779 | Oct 2018 | 5.144 | Nov 2019 | - | | 5.144 | 0.055 | 14.660 | - |
| GBSD ITASE 2 | MIPR | DIA-National Air and Space Intelligence Center : Fairborn, OH | 0.241 | 0.701 | Nov 2017 | 0.948 | Nov 2018 | 0.765 | Nov 2019 | - | | 0.765 | 0.265 | 2.920 | - |
| GBSD Nuclear Dust and Debris Environments Study | MIPR | Air Force Research Lab : Wright Patterson AFB, OH | 0.629 | 0.455 | Dec 2017 | 1.200 | Oct 2018 | 0.400 | Nov 2019 | - | | 0.400 | 1.106 | 3.790 | - |
| GBSD RS Test and Advanced Technology Interface (TMRR) | MIPR | Sandia National Labs : Various | 1.095 | 0.855 | Jan 2017 | 0.275 | Oct 2018 | - | | - | | - | 0.000 | 2.225 | - |

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|--|---|---|

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|---|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| GBSD Defense Accelerator (TMRR) | MIPR | Army Research Lab : Adelphi, MD | 1.283 | - | | - | | - | | - | | - | 0.000 | 1.283 | - |
| GBSD Launch Systems LF-26 (TMRR) | TBD | Various : Various | 0.000 | 0.010 | Jul 2018 | 3.990 | Jan 2019 | 3.010 | Oct 2019 | - | | 3.010 | 0.000 | 7.010 | - |
| GBSD Software Support | PO | 309th SMXG : Hill AFB, UT | 0.444 | 0.935 | Jan 2018 | 1.260 | Oct 2018 | 1.320 | Oct 2019 | - | | 1.320 | 2.708 | 6.667 | - |
| GBSD Test Vehicles | Various | Various : Various | 0.000 | - | | - | | 4.000 | Jan 2020 | - | | 4.000 | 134.000 | 138.000 | - |
| GBSD Instrument Testing | MIPR | Aerospace Corporation : El Segundo, CA | 0.000 | - | | - | | 7.600 | Nov 2019 | - | | 7.600 | 5.500 | 13.100 | - |
| GBSD Booster Ground Test | MIPR | Air Force Research Labs : Edwards AFB, CA | 0.000 | - | | - | | 4.300 | Nov 2019 | - | | 4.300 | 3.100 | 7.400 | - |
| GBSD Guidance, Navigation, and Control Instruments for Developmental Testing | TBD | TBD : Various | 0.000 | - | | - | | 21.600 | Nov 2019 | - | | 21.600 | 30.800 | 52.400 | - |
| GBSD / Missile Defense Agency Silo Fly-out Modelling / Simulation Development | MIPR | Various : Various | 0.000 | - | | - | | 5.500 | Nov 2019 | - | | 5.500 | 14.000 | 19.500 | - |
| GBSD Reentry System / Reentry Vehicle Modelling / Simulation Environment Development | MIPR | DIA Air & Space Intel : Fairborn, OH | 0.000 | - | | - | | 2.000 | Nov 2019 | - | | 2.000 | 4.000 | 6.000 | - |
| GBSD Enterprise Test and Assessments | C/Various | Various : Various | 3.407 | 0.909 | Nov 2017 | - | | - | | - | | - | 2,580.232 | 2,584.548 | - |
| Subtotal | | | 19.388 | 14.811 | | 26.737 | | 76.443 | | - | | 76.443 | 3,007.400 | 3,144.779 | N/A |

Remarks
 GBSD Independent Operational Test Agency includes planning and design costs for TMRR and EMD. Operational Test costs have been included in the GBSD Enterprise Test and Assessment line item.
 GBSD Enterprise Test and Assessments was labelled GBSD EMD Test Support in FY19 PB.
 GBSD Cybersecurity, Test and Evaluation Framework, Codes/Crypto will continue into EMD.

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|--|---|---|

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| GBSD PMA | Various | Various : Various | 1.024 | 1.363 | Oct 2017 | 1.066 | Oct 2018 | 1.055 | Oct 2019 | - | | 1.055 | 93.339 | 97.847 | - |
| GBSD Integration Support Contract | C/FFP | BAE : Hill AFB, UT | 26.391 | 14.787 | Oct 2017 | 13.230 | Oct 2018 | 17.220 | Oct 2019 | - | | 17.220 | 0.000 | 71.628 | - |
| GBSD Electronics Parts Strategy and Commonality | C/Various | Naval Surface Warfare Center : Crane, IN | 3.032 | 0.715 | Dec 2017 | 1.500 | Nov 2018 | 1.000 | Nov 2019 | - | | 1.000 | 4.200 | 10.447 | - |
| GBSD System Engineering and Acquisition Support | C/Various | Aerospace Corporation : El Segundo, CA | 4.660 | 5.407 | Oct 2017 | 6.952 | Nov 2018 | 7.722 | Nov 2019 | - | | 7.722 | 33.276 | 58.017 | - |
| GBSD IS/IT Support | C/Various | Various : Various | 0.376 | 11.502 | Dec 2017 | 27.100 | Dec 2018 | 9.000 | Oct 2019 | - | | 9.000 | 0.000 | 47.978 | - |
| GBSD Civilian Manpower | Various | US Gov Civilians : Hill AFB, UT | 0.000 | - | | 4.640 | Dec 2018 | 13.597 | Oct 2019 | - | | 13.597 | 41.914 | 60.151 | - |
| GBSD Environment Assessments | MIPR | Various : Various | 0.000 | - | | 1.635 | Dec 2018 | 4.623 | Dec 2019 | - | | 4.623 | 5.742 | 12.000 | - |
| GBSD Enterprise Infrastructure | C/Various | Various : Various | 0.000 | - | | - | | - | | - | | - | 329.703 | 329.703 | - |
| Subtotal | | | 35.483 | 33.774 | | 56.123 | | 54.217 | | - | | 54.217 | 508.174 | 687.771 | N/A |

Remarks
 GBSD is spearheading the Owning The Technical Baseline (OTTB) approach for system acquisition. This approach utilizes additional support and management services that would typically be performed by a Prime Contractor. Additional line items were created in FY20 to capture the breakout of management services in line with the OTTB strategy. GBSD Integration Support Contract, GBSD Electronic Parts Strategy and Commonality, and GBSD System Engineering and Acquisition Support have increased STE since the FY19 PB.
 GBSD IS/IT Support spiked in FY19 due to computer equipment and IT infrastructure purchases that were exclusive to FY19.
 GBSD Civilian Manpower includes the hiring of 128 new civilian personnel in FY19 and FY20.
 GBSD Environment Assessments funding spikes in FY20 to address reporting requirements related to National Environmental Policy Act. Reporting for test facilities begins in FY19 and operational facilities begins in FY20.

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|
| Project Cost Totals | 252.633 | 221.536 | 414.441 | 570.373 | - | 570.373 | 20,514.624 | 21,973.607 | N/A |

Remarks

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0605230F / <i>Ground Based Strategic Deterrent</i> | Project (Number/Name) 641025 / <i>GROUND BASED STRATEGIC DETERRENT (GBSD)</i> |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|--|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| Ground Based Strategic Deterrent (GBSD) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TMRR Phase | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Preliminary Design Review (Jun 2020) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Milestone B (Jul 2020) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| EMD Phase | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0605230F / <i>Ground Based Strategic Deterrent</i> | Project (Number/Name) 641025 / <i>GROUND BASED STRATEGIC DETERRENT (GBSD)</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| Ground Based Strategic Deterrent (GBSD) | | | | |
| TMRR Phase | 1 | 2018 | 4 | 2020 |
| Preliminary Design Review (Jun 2020) | 3 | 2020 | 3 | 2020 |
| Milestone B (Jul 2020) | 4 | 2020 | 4 | 2020 |
| EMD Phase | 4 | 2020 | 4 | 2024 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0207100F / <i>Light Attack Armed Reconnaissance (LAAR) Squadrons</i> |
|--|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|-----------------------------|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 0.000 | 0.000 | 35.000 | 0.000 | 35.000 | 35.000 | 35.000 | 0.000 | 0.000 | 0.000 | 105.000 |
| 643865: <i>Light Attack</i> | - | 0.000 | 0.000 | 35.000 | 0.000 | 35.000 | 35.000 | 35.000 | 0.000 | 0.000 | 0.000 | 105.000 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | - | - |

Note

PE 0207100F is not a new start. Experimentation prior year funding is currently being executed under BA04 PE 0604858F Tech Transition program. FY20 funds under this PE continues demonstration, prototype, and experimentation with technologies and concepts to enable or accelerate their transition to acquisition programs or operational use.

A. Mission Description and Budget Item Justification

The Light Attack Aircraft (LAA) platform increases combat capability and readiness at reduced operating costs for missions in permissive environments. LAA executes under a middle tier rapid fielding acquisition strategy pursuant to Section 804 of the FY16 National Defense Authorization Act. The LAA option offers flexibility and accelerates modernization of current and potential partner forces who do not require advanced fighter aircraft. The LAA effort supports the National Defense Strategy to counter violent extremism on a global scale, alongside allies and partners.

LAA squadrons will provide a deployable and sustainable multirole attack capability, capable of performing a diverse array of attack missions, including but not limited to, Close Air Support (CAS), Armed Reconnaissance, Strike Coordination and Reconnaissance (SCAR), Airborne Forward Air control (FAC-A), and Interdiction. Other tasks for which Light Attack aircraft is expected to be suitable include Combat Search and Rescue (CSAR), Rescue Escort (RESCORT), and Maritime Air Support (MAS). LAA squadrons executing these tasks allows our 4th and 5th Generation fighter fleets to implement a tailored training regimen to address declining core mission readiness and focus on preparing to deter or prevail in conflicts with peer adversaries. LAA will provide a deployable, persistent attack capability that can be employed with low footprint and light logistical support requirements.

The effort will experiment with additional aircraft and weapon technologies; tactics, techniques, and procedures (TTPs) and Joint Terminal Attack Controller training, as well as development of operational tactics of an exportable network with international partners.

Activities also include studies and analysis to support both current program planning and execution and future program planning. This program element may include necessary civilian pay expenses required to manage, execute, and deliver light attack capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, 0605898F, and 0605833F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0207100F / <i>Light Attack Armed Reconnaissance (LAAR) Squadrons</i> |
|--|---|

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Current President's Budget | 0.000 | 0.000 | 35.000 | 0.000 | 35.000 |
| Total Adjustments | 0.000 | 0.000 | 35.000 | 0.000 | 35.000 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 35.000 | 0.000 | 35.000 |

Change Summary Explanation

FY20 funding increased to support further experimentation. Prior year funding of \$100M in 2018 RDT&E in PE 0604858F 'Tech Transition'.

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| Title: LAA | 0.000 | 0.000 | 35.000 |
| Description: Prior Year funding include \$100M of 2018 RDT&E in PE 0604858F 'Tech Transition'. Funds provided to demonstrate, prototype and experiment with technologies and concepts to enable or accelerate their transition to acquisition programs and/or operational use. | | | |
| FY 2019 Plans: None | | | |
| FY 2020 Plans: The effort will continue and expand the experiment to include low cost economical manned and unmanned aircraft, rotary wing, turbojet and turboprop platforms with experimentation focused on assessing the capabilities, limitations, and other aspects against requirements in support of Counter Violent Extremist Organizations (C-VEO) operations. | | | |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| | |
|--|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0207100F / <i>Light Attack Armed Reconnaissance (LAAR) Squadrons</i> |
|--|---|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|---------|---------|---------|
| The effort will experiment with additional aircraft and weapon technologies; tactics, techniques, and procedures (TTPs) and Joint Terminal Attack Controller training, as well as development of operational tactics of an exportable network with international partners. | | | |
| <i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> Funding provided to continue experimentation. | | | |
| Accomplishments/Planned Programs Subtotals | 0.000 | 0.000 | 35.000 |

| D. Other Program Funding Summary (\$ in Millions) | | | | | | | | | | | |
|--|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|
| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> <u>Base</u> | <u>FY 2020</u> <u>OCO</u> | <u>FY 2020</u> <u>Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To</u> <u>Complete</u> | <u>Total Cost</u> |
| • APAF 04 OAX000: <i>Observation Attack Replacement (OA-X)</i> | 0.000 | 100.000 | 0.000 | - | 0.000 | - | 160.000 | 400.005 | 400.005 | Continuing | Continuing |

Remarks

E. Acquisition Strategy

The LAA acquisition strategy is anticipated to utilize other transaction agreements for prototyping purposes pursuant to 10 U.S.C. § 2371b.

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|--|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0207100F / <i>Light Attack Armed Reconnaissance (LAAR) Squadrons</i> | Project (Number/Name) 643865 / <i>Light Attack</i> |
|--|---|--|

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Experimentation | TBD | Not specified. : TBD | - | - | | - | | 31.850 | Dec 2019 | - | | 31.850 | Continuing | Continuing | - |
| Subtotal | | | - | - | | - | | 31.850 | | - | | 31.850 | Continuing | Continuing | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| PMA: Other Govt Cost | Various | Various : Dayton, OH | - | - | | - | | 3.150 | Dec 2019 | - | | 3.150 | Continuing | Continuing | - |
| Subtotal | | | - | - | | - | | 3.150 | | - | | 3.150 | Continuing | Continuing | N/A |

| | | | Prior Years | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|--|--|-------------|---------|--|---------|--|--------------|--|-------------|--|---------------|------------------|------------|--------------------------|
| Project Cost Totals | | | - | - | | 0.000 | | 35.000 | | - | | 35.000 | Continuing | Continuing | N/A |

Remarks

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0207100F / <i>Light Attack Armed Reconnaissance (LAAR) Squadrons</i> | Project (Number/Name) 643865 / <i>Light Attack</i> |

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
|-----------------|------------|
| LAA | |
| Experimentation | [REDACTED] |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0207100F / <i>Light Attack Armed Reconnaissance (LAAR) Squadrons</i> | Project (Number/Name) 643865 / <i>Light Attack</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|-----------------------|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| LAA | | | | |
| Experimentation | 1 | 2020 | 4 | 2022 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|--|--|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0207110F / <i>Next Generation Air Dominance</i> |
|--|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|-------------|---------|---------|--------------|-------------|---------------|-----------|-----------|-----------|-----------|------------------|------------|
| Total Program Element | - | 283.964 | 429.610 | 1,000.000 | 0.000 | 1,000.000 | 1,046.000 | 1,545.000 | 1,710.000 | 1,267.000 | Continuing | Continuing |
| 646007: <i>AS 2030 Air Dominance Technologies (ADT)</i> | - | 282.961 | 418.463 | 1,000.000 | 0.000 | 1,000.000 | 1,046.000 | 1,545.000 | 1,710.000 | 1,267.000 | Continuing | Continuing |
| 646203: <i>Air Dominance Air-to-Air Weapon</i> | - | 1.003 | 11.147 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

Next Generation Air Dominance (NGAD) is a family of capabilities enabling Air Superiority for the Joint Force in the most challenging operational environments. The program matures technology and reduces risk through prototyping activities and demonstration efforts. Key NGAD attributes include enhancements in survivability, lethality, and persistence across a range of military operations. The NGAD program is directed by Joint Requirements Oversight Council Memorandum (JROCM) 043-13 and CSAF approved Air Superiority Enterprise Capability Collaboration Team (ECCT) Flight Plan. Program activities will also include the pursuit of open architecture solutions including Open Mission Standards (OMS) and Universal Control Interface (UCI) standards management and preplanned product improvements. Funding provides program management support, operational concept exploration, technology studies, multi-domain integration assessments, operational and system architecture development, maturation and risk reduction of air superiority related technologies, including weapons systems and integrated system concept development and demonstration.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver NGAD capabilities. The use of such program funds would be in addition to the civilian pay expenses budgeted in PE's: 0605826F, 0605827F, 0605828F, 0605829F 0605830F, 0605831F, 0605832F, and 0605898F.

NGAD civilian pay is executed in PE 020711F.

Better Alignment of Resources: Next Generation Air Dominance (NGAD)

Deferral of the development of specific Next Generation Air Dominance (NGAD) classified technologies results in a realignment of \$357M in FY 2020, and \$6,646M across the FYDP, to fund the development of the most promising classified technologies, which improve lethality by providing expanded capabilities.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|--|--|
| Appropriation/Budget Activity | R-1 Program Element (Number/Name) |
| 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | PE 0207110F / <i>Next Generation Air Dominance</i> |

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 294.746 | 503.997 | 1,356.491 | 0.000 | 1,356.491 |
| Current President's Budget | 283.964 | 429.610 | 1,000.000 | 0.000 | 1,000.000 |
| Total Adjustments | -10.782 | -74.387 | -356.491 | 0.000 | -356.491 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | -70.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -10.032 | -4.387 | | | |
| • Other Adjustments | -0.750 | 0.000 | -356.491 | 0.000 | -356.491 |

Change Summary Explanation

FY 2018: -\$10.032M SBIRS and -\$0.750M FFRDC reductions

FY 2019: -\$70.0M Congressional Mark and -\$4.4M FFRDC reductions

FY 2020: Next Generation Air Dominance (NGAD) saved \$356.5M in BY. NGAD Description: Decision to defer development of specific classified technologies and refocus resources to develop the most promising classified technologies, which improve lethality by providing expanded capabilities.

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|---|--------------------|----------------|----------------|---------------------|--|----------------------|----------------|----------------|--|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 4 | | | | | R-1 Program Element (Number/Name) PE 0207110F / <i>Next Generation Air Dominance</i> | | | | Project (Number/Name) 646007 / <i>AS 2030 Air Dominance Technologies (ADT)</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 646007: <i>AS 2030 Air Dominance Technologies (ADT)</i> | - | 282.961 | 418.463 | 1,000.000 | 0.000 | 1,000.000 | 1,046.000 | 1,545.000 | 1,710.000 | 1,267.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

Next Generation Air Dominance (NGAD) is a family of capabilities enabling Air Superiority for the Joint Force in the most challenging operational environments. The PE matures technology and reduces risk through prototyping activities and demonstration efforts. Key NGAD attributes include enhancements in survivability, lethality, and persistence across a range of military operations. The NGAD program is directed by Joint Requirements Oversight Council Memorandum (JROCM) 043-13 and CSAF approved Air Superiority Enterprise Capability Collaboration Team (ECCT) Flight Plan. Program activities will also include the pursuit of open architecture solutions including Open Mission Standards (OMS) and Universal Control Interface (UCI) standards management and preplanned product improvements. Funding provides program management support, operational concept exploration, technology studies, multi-domain integration assessments, operational and system architecture development, maturation and risk reduction of air superiority related technologies, including weapons systems and integrated system concept development and demonstration.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| Title: 2030+ Air Dominance | 282.961 | 418.463 | 1,000.000 |
| Description: The 2030+ Air Dominance (AD) candidate concepts consist of operational analyses, threat studies and technology candidate assessments and prototyping to identify operational concepts and technologies that improve persistence, survivability, lethality, connectivity, interoperability and affordability in 2030 and beyond. These efforts will provide for contractors to conduct analyses, identify technology candidates and perform concept refinement. Furthermore, studies are required to develop operational/system architectures to include family of systems and system of systems. In addition, technical risk reduction activities will be performed to include experimentation, integration and building demonstrative prototypes. | | | |
| The 2030+ AD working groups methodically assessed candidate concepts using USAF directives and guidance. Resulting concepts informed the NGAD Analysis of Alternatives (AoA), which is in the final stages of coordination. Ongoing studies are conducted to refine system concepts and operational/system architectures incorporating family of systems and system of systems that may be required to inform and support strategic choices. In addition, technical risk reduction studies concerning technology integration, operational and system trade space utilizing preliminary data from AD concept development have resulted in multiple activities and engagements to inform strategic USAF experimentation and prototyping efforts. Finally, technical overviews were presented to the Air Force - Scientific Advisory Board (AF-SAB) and other senior leaders. | | | |
| FY 2019 Plans: | | | |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0207110F / <i>Next Generation Air Dominance</i> | Project (Number/Name) 646007 / <i>AS 2030 Air Dominance Technologies (ADT)</i> |

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| <p>The 2030+ Air Dominance candidate concepts consist of operational analyses, threat studies and technology candidate assessments and prototyping to identify operational concepts and technologies that improve persistence, survivability, lethality, connectivity, interoperability and affordability in 2030 and beyond. These efforts will provide for contractors to conduct analyses, identify technology candidates and perform concept refinement. Furthermore, studies are required to develop operational/system architectures to include family of systems and system of systems. In addition, technical risk reduction activities will be performed to include experimentation, integration and building demonstrative prototypes. Program activities will also include the pursuit of open architecture solutions.</p> <p><i>FY 2020 Plans:</i> The 2030+ Air Dominance candidate concepts consist of operational analyses, threat studies and technology candidate assessments and prototyping to identify operational concepts and technologies that improve persistence, survivability, lethality, connectivity, interoperability and affordability in 2030 and beyond. These efforts will provide for contractors to conduct analyses, identify technology candidates and perform concept refinement. Furthermore, studies are required to develop operational/system architectures to include family of systems and system of systems. In addition, technical risk reduction activities will be performed to include experimentation, integration and building demonstrative prototypes. Program activities will also include the pursuit of open architecture solutions.</p> <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> Program increasing technology maturation, risk reduction activities, and hardware prototyping efforts</p> | | | |
| Accomplishments/Planned Programs Subtotals | 282.961 | 418.463 | 1,000.000 |

| C. Other Program Funding Summary (\$ in Millions) | | | | | | | | | | | |
|--|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|
| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> <u>Base</u> | <u>FY 2020</u> <u>OCO</u> | <u>FY 2020</u> <u>Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To</u> <u>Complete</u> | <u>Total Cost</u> |
| • RDTE 04 0207110F/646203: <i>Air Dominance Air-to-Air Weapon</i> | 1.003 | 11.147 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | - | Continuing | Continuing |

Remarks
N/A

D. Acquisition Strategy
The Next Generation Air Dominance acquisition strategy is based on top-down, multi-domain capabilities development planning and oversight framework. Cross-functional teams will conduct analysis, demonstrations, and experiments to quantify the operational value of alternative concepts and technologies to provide solutions to current and future air superiority capability gaps.

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0207110F / <i>Next Generation Air Dominance</i> | Project (Number/Name) 646007 / <i>AS 2030 Air Dominance Technologies (ADT)</i> |

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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|--|---|---|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0207110F / Next Generation Air Dominance | Project (Number/Name) 646007 / AS 2030 Air Dominance Technologies (ADT) |
|--|---|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Research/Development Efforts | Various | Various : Various | - | 268.419 | | 394.262 | | 945.310 | | - | | 945.310 | Continuing | Continuing | - |
| Subtotal | | | - | 268.419 | | 394.262 | | 945.310 | | - | | 945.310 | Continuing | Continuing | N/A |

Remarks
Contractual specifics are not available at this level of security classification.

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Program Management Support | Various | Various : Various | - | 14.542 | | 24.201 | | 54.690 | | - | | 54.690 | Continuing | Continuing | - |
| Subtotal | | | - | 14.542 | | 24.201 | | 54.690 | | - | | 54.690 | Continuing | Continuing | N/A |

Remarks
May include civ pay for FY18+

| Project Cost Totals | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|--------------------|----------------|----------------|---------------------|--------------------|----------------------|-------------------------|-------------------|---------------------------------|
| | - | 282.961 | 418.463 | 1,000.000 | - | 1,000.000 | Continuing | Continuing | N/A |

Remarks
Details of contract data are not shown because of the level of security classification.

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0207110F / <i>Next Generation Air Dominance</i> | Project (Number/Name) 646007 / <i>AS 2030 Air Dominance Technologies (ADT)</i> |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| AS 2030 Air Dominance Technologies (ADT) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Analysis of Alternatives | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Concept Exploration | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Integration Studies | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Technology Risk Reduction / Prototyping | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FY19 Strategic Planning Choices Presented | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FY20 Strategic Planning Choices Presented | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FY21 Strategic Planning Choices Presented | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FY22 Strategic Planning Choices Presented | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FY23 Strategic Planning Choices Presented | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FY24 Strategic Planning Choices Presented | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FY25 Strategic Planning Choices Presented | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0207110F / <i>Next Generation Air Dominance</i> | Project (Number/Name) 646007 / <i>AS 2030 Air Dominance Technologies (ADT)</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|---|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| AS 2030 Air Dominance Technologies (ADT) | | | | |
| Analysis of Alternatives | 1 | 2018 | 2 | 2019 |
| Concept Exploration | 1 | 2018 | 4 | 2024 |
| Integration Studies | 1 | 2018 | 4 | 2024 |
| Technology Risk Reduction / Prototyping | 1 | 2018 | 4 | 2024 |
| FY19 Strategic Planning Choices Presented | 1 | 2018 | 1 | 2018 |
| FY20 Strategic Planning Choices Presented | 1 | 2018 | 1 | 2018 |
| FY21 Strategic Planning Choices Presented | 1 | 2019 | 1 | 2019 |
| FY22 Strategic Planning Choices Presented | 1 | 2020 | 1 | 2020 |
| FY23 Strategic Planning Choices Presented | 1 | 2021 | 1 | 2021 |
| FY24 Strategic Planning Choices Presented | 1 | 2022 | 1 | 2022 |
| FY25 Strategic Planning Choices Presented | 1 | 2023 | 1 | 2024 |

Note

Analysis of Alternatives began 2QFY17

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|---|--------------------|----------------|----------------|---------------------|---|----------------------|----------------|----------------|--|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 4 | | | | | R-1 Program Element (Number/Name) PE 0207110F / Next Generation Air Dominance | | | | Project (Number/Name) 646203 / Air Dominance Air-to-Air Weapon | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 646203: Air Dominance Air-to-Air Weapon | - | 1.003 | 11.147 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

Next Generation Air Dominance (NGAD) is a family of capabilities enabling Air Superiority for the Joint Force in the most challenging operational environments. The PE matures technology and reduces risk through prototyping activities and demonstration efforts. Key NGAD attributes include enhancements in survivability, lethality, and persistence across a range of military operations. The NGAD program is directed by Joint Requirements Oversight Council Memorandum (JROCM) 043-13 and CSAF approved Air Superiority Enterprise Capability Collaboration Team (ECCT) Flight Plan. Program activities will also include the pursuit of open architecture solutions including Open Mission Standards (OMS) and Universal Control Interface (UCI) standards management and preplanned product improvements. Funding provides program management support, operational concept exploration, technology studies, multi-domain integration assessments, operational and system architecture development, maturation and risk reduction of air superiority related technologies, including weapons systems and integrated system concept development and demonstration.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| Title: AS2030 Weapons | 1.003 | 11.147 | 0.000 |
| Description: The 2030+ Air Dominance Weapon Systems candidate concepts will develop, refine and integrate technologies into evolving threat scenarios and environments. Funding supports studies that refine system concepts and operational/system architectures to include family of systems and system of systems are required in support of the strategic choices and technical risk reduction activities that include but not limited to experimentation, integration and building demonstrative prototypes. | | | |
| FY 2019 Plans: The 2030+ Air Dominance candidate concepts consist of operational analyses, threat studies and technology assessments to identify operational concepts and technologies to improve persistence, survivability, lethality, connectivity, interoperability and affordability in 2030+ timeframe and beyond. These efforts will provide for contractors to conduct analyses and concept studies. Additional studies are required to develop operational/system architectures to include family of systems and system of systems. Includes A&AS, travel, supplies, other government costs, and program costs. | | | |
| FY 2020 Plans: N/A | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: | | | |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0207110F / <i>Next Generation Air Dominance</i> | Project (Number/Name) 646203 / <i>Air Dominance Air-to-Air Weapon</i> |

| | | | |
|---|----------------|----------------|----------------|
| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
| Decrease in scope | | | |
| Accomplishments/Planned Programs Subtotals | 1.003 | 11.147 | 0.000 |

C. Other Program Funding Summary (\$ in Millions)

| Line Item | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|----------------|----------------|-------------------------|------------------------|--------------------------|----------------|----------------|----------------|----------------|-----------------------------|-------------------|
| • RDTE 04 0207110F/646007: 2030+ AIR DOMINANCE AOS | 282.961 | 418.463 | 1,000.000 | - | 1,000.000 | 1,046.000 | 1,545.000 | 1,710.000 | 1,267.000 | Continuing | Continuing |

Remarks

N/A

D. Acquisition Strategy

The Next Generation Air Dominance Air-to-Air Weapon acquisition strategy is based on top-down, multi-domain capabilities development planning and oversight framework. Cross-functional teams will conduct analysis, demonstrations, and experiments to quantify the operational value of alternative concepts and technologies to provide solutions to current and future air superiority capability gaps.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|--|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0207110F / Next Generation Air Dominance | Project (Number/Name) 646203 / Air Dominance Air-to-Air Weapon |
|--|---|--|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Research/Development Efforts | Various | Various : Various | - | 1.003 | | 11.147 | | - | | - | | - | Continuing | Continuing | - |
| Subtotal | | | - | 1.003 | | 11.147 | | - | | - | | - | Continuing | Continuing | N/A |

Remarks
Contractual specifics are not available at this level of security classification.
Includes PMA activities and may include program specific civilian pay expenses.

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|
| Project Cost Totals | - | 1.003 | 11.147 | - | - | - | Continuing | Continuing | N/A |

Remarks
Contractual specifics are not available at this level of security classification.
Includes PMA activities and may include program specific civilian pay expenses.

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0207110F / <i>Next Generation Air Dominance</i> | Project (Number/Name) 646203 / <i>Air Dominance Air-to-Air Weapon</i> |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| <i>Air Dominance Air-to-Air Weapon</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Analysis of Alternatives | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Concept Exploration | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Integration Studies | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Technical Risk Reduction | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FY20 Strategic Planning Choices Presented | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FY21 Strategic Planning Choices Presented | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FY22 Strategic Planning Choices Presented | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0207110F / <i>Next Generation Air Dominance</i> | Project (Number/Name) 646203 / <i>Air Dominance Air-to-Air Weapon</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|---|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Air Dominance Air-to-Air Weapon</i> | | | | |
| Analysis of Alternatives | 1 | 2018 | 2 | 2019 |
| Concept Exploration | 1 | 2018 | 4 | 2020 |
| Integration Studies | 1 | 2018 | 4 | 2020 |
| Technical Risk Reduction | 1 | 2018 | 4 | 2020 |
| FY20 Strategic Planning Choices Presented | 1 | 2018 | 1 | 2018 |
| FY21 Strategic Planning Choices Presented | 1 | 2019 | 1 | 2019 |
| FY22 Strategic Planning Choices Presented | 1 | 2020 | 1 | 2020 |

Note

- FY19 is last year of BPAC 646203 funding. It supports Strategic Planning Choices activity through FY20
- Analysis of Alternatives began 2QFY17

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0207455F / <i>Three Dimensional Long-Range Radar (3DELRR)</i> |
|--|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | 146.754 | 12.122 | 24.856 | 37.290 | 0.000 | 37.290 | 34.196 | 18.396 | 0.468 | 0.475 | 30.343 | 304.900 |
| 646002: <i>Three Dimensional Expeditionary Long Range Radar</i> | 146.754 | 12.122 | 24.856 | 37.290 | 0.000 | 37.290 | 34.196 | 18.396 | 0.468 | 0.475 | 30.343 | 304.900 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | - | - |

Program MDAP/MAIS Code: 393

A. Mission Description and Budget Item Justification

Mission Description: The Three-Dimensional Expeditionary Long-Range Radar (3DELRR) will be the principal USAF long-range, ground-based sensor for detecting, identifying, tracking and reporting aerial tracks for the Joint Force Air Component Commander (JFACC) through the Theater Air Control System. The 3DELRR system will provide multiple benefits and increased capabilities to the USAF and to the Joint Services: 1) Replace the aging USAF AN/TPS-75 radar system, which is at the end of its service life and costly to maintain; 2) Detect and track highly maneuverable, small radar cross section air-breathing targets; 3) Mitigate reliability, operational availability, maintainability, transportability and sustainability issues, which plague the AN/TPS-75 radar system; 4) Enable greater battlefield and battlespace awareness through its precise, real-time air picture of sufficient quality to control individual aircraft under a wide range of environmental and operational conditions; 5) Serve as a pilot program for Defense Exportability Features (DEF) to maximize export potential early in the design phase while reducing 3DELRR life cycle costs through increased production; and 6) Provide exchange of information to the United States Marine Corps, Navy and Army via appropriate interfaces.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver Three-Dimensional Expeditionary Long-Range Radar weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, and 0605898F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|---|
| Appropriation/Budget Activity 3600: Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P) | R-1 Program Element (Number/Name) PE 0207455F I Three Dimensional Long-Range Radar (3DELRR) |
|---|---|

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 10.645 | 40.326 | 41.416 | 0.000 | 41.416 |
| Current President's Budget | 12.122 | 24.856 | 37.290 | 0.000 | 37.290 |
| Total Adjustments | 1.477 | -15.470 | -4.126 | 0.000 | -4.126 |
| • Congressional General Reductions | -0.356 | -15.470 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 2.020 | 0.000 | | | |
| • SBIR/STTR Transfer | -0.187 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | -4.126 | 0.000 | -4.126 |

Change Summary Explanation

FY18 and FY19 adjusted to reflect Congressional General Reductions, FFRDC, and Reprogramming.

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
|---|----------------|----------------|----------------|

| | | | |
|--|-------|--------|--------|
| Title: Contractor Engineering and Manufacturing Development (EMD) | 0.000 | 16.006 | 23.896 |
|--|-------|--------|--------|

Description: Contractor's portion of EMD efforts contribute to the overall development of 3DELRR capabilities.

FY 2019 Plans:

Activities will include but are not limited to the following:

- Mitigate known risks associated with hardware, software and test during the EMD phase of the 3DELRR program
- Conduct Test Readiness Review (TRRs) prior to Contractor Developmental Test and Evaluation (CDT&E) events
- Continue to complete build of three (3) Engineering & Manufacturing Development (EMD) units
- Continue to support the Defense Exportability Features (DEF) effort
- Continue IFF Box Certification
- Continue contractor developmental testing of components & subsystems
- Continue planning of Government Developmental Test & Evaluation (DT&E)
- Support studies and analyses to assess future capabilities
- Update the Modeling and Simulation (M&S) plan as needed
- Update the Test and Evaluation Master Plan (TEMP) as needed
- Continue development of technical manuals
- Continue development of interoperability with external agencies as required

FY 2020 Plans:

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | | R-1 Program Element (Number/Name) PE 0207455F / <i>Three Dimensional Long-Range Radar (3DELRR)</i> | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| <p>Activities will include but are not limited to the following:</p> <ul style="list-style-type: none"> - Will mitigate known risks associated with hardware, software and test during the EMD phase of the 3DELRR program - Will conduct Test Readiness Reviews (TRRs) prior to specific Contractor Developmental Test and Evaluation (CDT&E) events - Will continue to complete build of three (3) Engineering & Manufacturing Development (EMD) units - Will continue to support the Defense Exportability Features (DEF) effort - Will continue IFF Box Certification - Will continue contractor developmental testing of components & subsystems - Will initiate full system CDT&E - Will continue planning of Government Developmental Test & Evaluation (DT&E) - Will continue physical configuration audit pending completion of EMD units - Will continue to support studies and analyses to assess future capabilities - Will continue to update the Modeling and Simulation (M&S) plan as needed - Will continue to update the Test and Evaluation Master Plan (TEMP) as needed - Will continue the development of technical manuals - Will continue development of interoperability with external agencies as required <p>FY 2019 to FY 2020 Increase/Decrease Statement: Risks associated with the development of the 3DELRR system have not yet been realized.</p> | | | | |
| <p>Title: Government Developmental Test and Evaluation (DT&E) Planning/Preparation</p> <p>Description: Early planning and preparation for Government DT&E.</p> <p>FY 2019 Plans: Activities will include but are not limited to the following:</p> <ul style="list-style-type: none"> - Monitor and evaluate contractor DT&E and tailor lessons for Government DT&E - Continue to develop and refine of TEMP and other test planning documentation - Conduct test site surveys - Continue to plan for cybersecurity testing - Continue to integrate Modeling and Simulation (M&S) into test plans - Continue site infrastructure improvements to support Government DT&E - Initiate Environmental Testing (McKinley Climatological Lab) - Training and travel in preparation for Government DT&E <p>FY 2020 Plans: Activities will include but are not limited to the following:</p> | | 0.651 | 3.077 | 5.318 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | | R-1 Program Element (Number/Name) PE 0207455F / <i>Three Dimensional Long-Range Radar (3DELRR)</i> | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| <ul style="list-style-type: none"> - Will continue to monitor and evaluate CDT&E: tailor lessons for Government DT&E - Will witness formal CDT&E events - Will continue development and refinement of TEMP and other test planning documentation - Will conduct site surveys and continue cybersecurity planning - Will conduct 3DELRR Mobility Testing - Will continue Environmental Testing (McKinley Climatological Lab) - Will continue to integrate Modeling and Simulation (M&S) into test plans - Will prepare for Test Readiness Review (TRR) to support Government Developmental Test & Evaluation (DT&E) - Will continue site infrastructure improvements to support Government DT&E - Will conduct training and travel in preparation for Government DT&E <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funds increase from FY19 to FY20 for start and completion of DT&E readiness review and start/ramp-up of Government Development, Training and witness of CDT&E.</p> | | | | |
| <p>Title: Systems Engineering/Technical Support</p> <p>Description: Efforts provide management, engineering and technical support to the program office.</p> <p>FY 2019 Plans: Activities will include but are not limited to the following:</p> <ul style="list-style-type: none"> - Continue EMD efforts to further mature technology readiness and manufacturing capabilities - Lead and manage program through daily interaction with contractor and key stakeholders - Oversee programmatic design and technical reviews - Monitor reliability growth during contractor component, subsystem and system level testing - Identify, monitor and mitigate program and technical risks; facilitate program office reporting - Continue preparation of Milestone C documentation - Continue follow-on product support BCA, various studies/analyses and planning activities - Continue efforts for interoperability with external agencies as required <p>FY 2020 Plans: Activities will include but are not limited to the following:</p> <ul style="list-style-type: none"> - Will continue EMD efforts to further mature technology readiness and manufacturing capabilities - Will continue to Lead and manage program through daily interaction with contractor and key stakeholders - Will continue to oversee programmatic design and technical reviews - Will continue to monitor reliability growth during contractor component, subsystem and system level testing | | 11.471 | 5.773 | 8.076 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|---|
| Appropriation/Budget Activity 3600: Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P) | R-1 Program Element (Number/Name) PE 0207455F I Three Dimensional Long-Range Radar (3DELRR) |
|---|---|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| <ul style="list-style-type: none"> - Will continue to identify, monitor and mitigate program and technical risks; facilitate program office reporting - Will continue preparation of Milestone C documentation - Will continue follow-on product support BCA, various studies/analyses and planning activities - Will continue efforts for interoperability with external agencies as required <p>FY 2019 to FY 2020 Increase/Decrease Statement: Portions of FY19 program support requirements were funded with FY18 funds; program support requirements remain consistent.</p> | | | |
| Accomplishments/Planned Programs Subtotals | 12.122 | 24.856 | 37.290 |

| D. Other Program Funding Summary (\$ in Millions) | | | | | | | | | | | |
|---|----------------|----------------|-------------------------|------------------------|--------------------------|----------------|----------------|----------------|----------------|-----------------------------|-------------------|
| Line Item | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| • OPAF 03 Line Item 833060: 3D Expeditionary Long Range-Radar | - | 0.000 | 0.000 | - | 0.000 | 63.075 | 21.902 | 156.775 | 119.792 | 636.350 | 997.894 |

Remarks

E. Acquisition Strategy

The 3DELRR strategy is a single step acquisition approach for full capability to develop, produce and field a highly capable and sustainable, expeditionary long-range radar. A limited competition was conducted for the Engineering and Manufacturing Development (EMD) contract among the multiple contractors that participated in two Technology Maturation and Risk Reduction (TMRR) phases.

The EMD contract was awarded 11 May 2017 to a single developer to complete the final design, build, integration and test of the 3DELRR system; with options to produce Low Rate Initial Production (LRIP) units, conduct Interim Contractor Support (ICS), and produce Full Rate Production (FRP) units.

The primary contract type for EMD is a Fixed Price Incentive Firm (FPIF). The contract also includes a FPIF option to execute LRIP, Cost Plus Fixed Fee (CPFF) options for ICS and Firm Fixed Price (FFP) options for FRP. A CPFF option is planned for ICS due to the uncertainty of the quantity and the exact nature of the work. An FFP option is planned for FRP due to stable requirements and low risk of changes in scope. The program office will exercise the LRIP option upon Milestone Decision Authority (MDA) approval at MS C. The program office will also seek MDA approval to exercise ICS options (as necessary) and FRP options.

The EMD prime contractor will deliver three (3) EMD units, which will be the primary assets used for Contractor Developmental Test and Evaluation (CDT&E) and Government Developmental Test and Evaluation (DT&E). The three (3) EMD units will also be used for Initial Operational Test and Evaluation (IOT&E) once LRIP equivalency is certified. The LRIP option provides scope for the refurbishment of these three (3) EMD units to production quality specifications after the successful completion of IOT&E. The LRIP option also enables the delivery of three (3) additional production quality units for a total of six (6) units at Initial Operational Capability (IOC).

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| Appropriation/Budget Activity | R-1 Program Element (Number/Name) |
|--|--|
| 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | PE 0207455F / <i>Three Dimensional Long-Range Radar (3DELRR)</i> |

Program Office will request MDA approval to use procurement funds prior to MS C to procure early Low Rate Initial Production (LRIP) materials to reduce schedule risk. The FRP options will deliver an additional twenty-nine (29) units for a total of thirty-five (35) units at Full Operational Capability (FOC).

The MDA for the 3DELRR program is the Assistant Secretary of the Air Force (Acquisition). The Air Force Program Executive Officer (PEO) for Battle Management (AFPEO BM) located at Hanscom AFB, MA is the PEO for 3DELRR. The Air Force Life Cycle Management Center (AFLCMC) located at Wright-Patterson AFB, OH is the contracting authority for the 3DELRR program, as AFLCMC provides contracting, legal, comptroller, programmatic, engineering, test and logistics support.

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|---|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0207455F / Three Dimensional Long-Range Radar (3DELRR) | Project (Number/Name) 646002 / Three Dimensional Expeditionary Long Range Radar |
|--|---|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| EMD Phase (Prime Contract) | C/FPIF | Raytheon, Woburn, MA : NV | 110.701 | - | | 16.006 | Sep 2019 | 23.896 | Sep 2020 | - | | 23.896 | 36.629 | 187.232 | 56.640 |
| Subtotal | | | 110.701 | - | | 16.006 | | 23.896 | | - | | 23.896 | 36.629 | 187.232 | N/A |

Remarks
 - FINANCIAL PERFORMANCE: 3DELRR is evaluated against traditional Research and Development (R&D) program expenditure benchmarks. Unlike many traditional R&D programs, however, the 3DELRR EMD contract is a FPIF contract with progress payments. 20 percent of incurred costs are withheld until the end of the contract, when they are liquidated. Mandatory funding obligations and progress payment withholds will cause the program to lag traditional expenditure benchmarks, painting an inaccurate portrait of overall program health. The program has an approved funding profile that reflects the Service Cost Position that includes program risk. Target value of contract remains at \$56.640M, total cost for product development (\$204.369M) reflects total spending from program initiation through EMD.

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---------------------------------|------------------------|---|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| System Engineering - A | SS/CPFF | MIT/Lincoln Laboratory : Lexington, MA | 6.887 | 1.550 | Nov 2017 | 1.206 | Sep 2019 | 1.210 | Nov 2019 | - | | 1.210 | 1.178 | 12.031 | - |
| System Engineering - B | SS/CPFF | Carnegie Mellon University : Pittsburgh, PA | 0.419 | 0.233 | Oct 2017 | 0.314 | Sep 2019 | 0.320 | Oct 2019 | - | | 0.320 | 0.289 | 1.575 | - |
| System Engineering - C | SS/CPFF | GTRI : Atlanta, GA | 1.450 | 0.773 | Feb 2018 | 0.725 | Feb 2019 | 0.730 | Feb 2020 | - | | 0.730 | 0.910 | 4.588 | - |
| System Engineering - D | SS/CPFF | MITRE : Bedford, MA | 4.625 | 4.310 | Oct 2017 | 1.126 | Sep 2019 | 2.243 | Oct 2019 | - | | 2.243 | 2.216 | 14.520 | - |
| Subtotal | | | 13.381 | 6.866 | | 3.371 | | 4.503 | | - | | 4.503 | 4.593 | 32.714 | N/A |

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Government Developmental Test and Evaluation Planning and Preparation | PO | 46 TS : Eglin AFB, FL | 2.178 | 0.651 | Jan 2018 | 3.077 | Jan 2019 | 5.318 | Jan 2020 | - | | 5.318 | 3.849 | 15.073 | - |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0207455F / <i>Three Dimensional Long-Range Radar (3DELRR)</i> | Project (Number/Name) 646002 / <i>Three Dimensional Expeditionary Long Range Radar</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Three Dimensional Expeditionary Long Range Radar</i> | | | | |
| EMD | 1 | 2018 | 2 | 2022 |
| Government DT&E Planning/Preparation | 1 | 2018 | 1 | 2021 |
| Critical Design Review (CDR) | 2 | 2018 | 2 | 2018 |
| Contractor Development Test & Evaluation (CDT&E) | 2 | 2019 | 4 | 2020 |
| Developmental Test and Evaluation Test Readiness Review | 4 | 2020 | 4 | 2020 |
| Government Development Test | 1 | 2021 | 2 | 2022 |
| EMD Unit Delivery | 1 | 2021 | 1 | 2021 |
| Operational Test Readiness Review (OTRR) | 2 | 2022 | 2 | 2022 |
| Milestone C | 2 | 2022 | 2 | 2022 |
| Government Operational Test | 3 | 2022 | 2 | 2023 |
| LRIP Materials Buy Prior to MS C | 4 | 2021 | 1 | 2022 |
| Low Rate Initial Production (LRIP) | 2 | 2022 | 4 | 2024 |
| Full Rate Production (FRP) Decision | 3 | 2023 | 3 | 2023 |
| Full Rate Production | 3 | 2023 | 4 | 2024 |

Note

Program Office will request MDA approval to use procurement funds prior to MS C to procure early Low Rate Initial Production (LRIP) materials to reduce schedule risk. The FRP options will deliver an additional twenty-nine (29) units for a total of thirty-five (35) units at Full Operational Capability (FOC).

LRIP phase ends 1QFY25
FRP phase ends 2QFY30

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | | | | | R-1 Program Element (Number/Name) PE 0208099F I <i>Unified Platform (UP)</i> | | | | | | | |
|--|--------------------|----------------|----------------|---------------------|--|----------------------|----------------|----------------|----------------|----------------|-------------------------|-------------------|
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| Total Program Element | - | 0.000 | 29.800 | 10.000 | 0.000 | 10.000 | 6.000 | 0.000 | 0.000 | 0.000 | 0.000 | 45.800 |
| 646504: <i>AF Prototyping</i> | - | 0.000 | 19.800 | 5.000 | 0.000 | 5.000 | 3.000 | 0.000 | 0.000 | 0.000 | 0.000 | 27.800 |
| 646505: <i>USCYBERCOM Prototyping</i> | - | 0.000 | 10.000 | 5.000 | 0.000 | 5.000 | 3.000 | 0.000 | 0.000 | 0.000 | 0.000 | 18.000 |

A. Mission Description and Budget Item Justification

Unified Platform provides the Cyber Mission Forces, U.S. Cyber Command (USCYBERCOM), AF Major Commands (MAJCOM), and Service cyber components a Joint cyber operations infrastructure enabling full spectrum cyberspace operations at the operational through tactical levels of warfare. The DoD, AF, and the Cyber Mission Force require an interconnected and interoperable cyber infrastructure to conduct integrated planning and execution of cyberspace operations. Unified Platform delivers this capability through the integration of disparate, Service-specific platforms and systems, infrastructure, mission capabilities, data analytics, and programs to build interoperable and scalable network for cyber capabilities. A common, Unified Platform allows the DoD to achieve and maintain decision and operational superiority, the key to successful cyber operations within the highly dynamic cyberspace domain.

Unified Platform rapid prototyping efforts integrate Service-specific cyber capabilities and explore novel cyber technologies culminating in an initial Unified Platform capability (e.g. minimum viable product). The rapidly evolving cyberspace domain requires flexibility in which rapid prototyping activities inform the initial Unified Platform capability baseline through the early stages of technology maturation and delivery. Rapid prototyping efforts are executed in an operational development environment to expedite development and evaluation of cyber capabilities within relevant warfighter timelines and are transitioned to Foundational Efforts (BA 7, PE 0208099F Unified Platform, 672281 Foundational Efforts) once included in the Unified Platform baseline.

The Secretary of the Air Force leads the Unified Platform effort as Executive Agent on behalf of the Department of Defense. Unified Platform directly supports the Joint Network Attack Initial Capabilities Document (ICD), the National Military Strategy for Cyberspace Operations (NMS-CO), USCYBERCOM operational directives, the latest MAJCOM Offensive Cyberspace Operations System Flight Plan, and other formal requirements documents.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver Unified Platform weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, 0605898F, and 0605833F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0208099F / <i>Unified Platform (UP)</i> |
|--|--|

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 0.000 | 29.800 | 10.000 | 0.000 | 10.000 |
| Current President's Budget | 0.000 | 29.800 | 10.000 | 0.000 | 10.000 |
| Total Adjustments | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

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|---|--------------------|----------------|----------------|---------------------|--|----------------------|----------------|----------------|--|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 4 | | | | | R-1 Program Element (Number/Name) PE 0208099F / <i>Unified Platform (UP)</i> | | | | Project (Number/Name) 646504 / <i>AF Prototyping</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 646504: <i>AF Prototyping</i> | - | 0.000 | 19.800 | 5.000 | 0.000 | 5.000 | 3.000 | 0.000 | 0.000 | 0.000 | 0.000 | 27.800 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

The rapidly evolving cyberspace domain demands highly flexible requirements, acquisition activities, and operations to respond to emerging opportunities or mitigate adversary actions. Salient to this mission area, rapid prototyping activities provide the structure to rapidly develop, evaluate, and integrate new cyber capabilities and inform the initial Unified Platform capability baseline during the early stages of technology maturation and delivery. Air Force Prototyping efforts support this need through rapid and exploratory research, prototype development, risk reduction, testing, and integration of cyber capabilities contributing to early operational development of the Unified Platform capability baseline. The USAF in conjunction with the Services and National Agencies execute operationally focused research and development and rapid prototyping to explore and determine validity of potential infrastructure, architectures, and capabilities/tools to support Cyber Mission Forces. These rapid prototyping efforts will be tailored for near-immediate integration into the Unified Platform baseline (BA 7, PE 0208099F Unified Platform, BPAC 672281 Foundational Efforts) for delivery to cyber warfighters.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| Title: AF Prototyping | 0.000 | 19.800 | 5.000 |
| Description: AF prototyping efforts will initially develop the UP Minimum Viable Product (MVP) baseline from existing "best of breed" systems, completed prototyping efforts, existing Service-developed solutions, joint user-input, and other sources | | | |
| FY 2019 Plans: | | | |
| - Develop incremental operational capability addressing the highest priority user requirements | | | |
| - Deliver prototyping efforts to inform Unified Platform capability baseline | | | |
| - Some aspects of the effort are classified and will be provided on a need-to-know basis. | | | |
| FY 2020 Plans: | | | |
| - Will continue to develop incremental operational capability addressing highest priority user requirements. | | | |
| - Some aspects of the effort are classified and will be provided on a need-to-know basis. | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: | | | |
| Funding decreased due to integration of AF prototyping efforts into Unified Platform baseline and reduction of rapid prototyping activity | | | |
| Accomplishments/Planned Programs Subtotals | 0.000 | 19.800 | 5.000 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0208099F / <i>Unified Platform (UP)</i> | Project (Number/Name) 646504 / <i>AF Prototyping</i> |

C. Other Program Funding Summary (\$ in Millions)

| Line Item | FY 2018 | FY 2019 | FY 2020 | FY 2020 | FY 2020 | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To | |
|---|---------|---------|---------|---------|---------|---------|---------|---------|---------|------------|------------|
| | | | Base | OCO | Total | | | | | Complete | Total Cost |
| • RDTE 07 0208099F: <i>Unified Platform (UP)</i> | - | 26.559 | 84.702 | - | 84.702 | 98.701 | 114.713 | 114.721 | 125.436 | Continuing | Continuing |
| • OPAF 03 835080: <i>AFNET</i> | - | - | 4.963 | - | 4.963 | 4.964 | 4.962 | 4.961 | 5.050 | Continuing | Continuing |

Remarks

D. Acquisition Strategy

Unified Platform represents a flexible, interoperable, and scalable warfighter capability to be employed by the Army, Navy, Marine Corps, and Air Force in conjunction with U.S. Cyber Command (USCYBERCOM). In order to match the speed of need of the highly dynamic cyberspace domain, the Service-agnostic Unified Platform capability implements a scaled agile development framework (SAFe) to facilitate the rapid development, integration, and fielding of capabilities to remain responsive to evolving warfighter requirements. The Unified Platform program executes the agile development requirements provided by the Army, Navy, Marine Corps, Air Force, and USCYBERCOM stakeholders in accordance with the prioritization provided by the multi-Service Unified Platform governance structure.

The initial Unified Platform capability will deliver a minimum viable product (MVP) for immediate deployment and operational use by the Cyber Mission Force. Subsequent build iterations will continue to deliver enhanced capabilities, incrementally building the Unified Platform capability to match warfighter needs and requirements to achieve cyberspace dominance. Early development of the Unified Platform baseline capability relies on extensive rapid prototyping efforts to analyze integration constraints and opportunities of Service-specific cyber capabilities to realize the Unified Platform MVP and inform the future Unified Platform baseline (BA 4, PE 0208099F Unified Platform, 646504 AF Prototyping and 646505 USCYBERCOM Prototyping). In parallel, an enduring foundational Unified Platform thrust area supports the development and maturation of Unified Platform baseline, integrates successful prototyping activities, and implements an agile development/security/operations (DevSecOps) construct to rapidly evolve and enhance the Unified Platform capability to match warfighter requirements (BA 7, PE 0208099F Unified Platform, 672281 Foundational Efforts).

The Unified Platform program office utilizes Concept, Development, Risk management, Production, or Deployment Plans as part of a streamlined approach to agile acquisition planning. All plans contain sufficient information to inform acquisition decisions (i.e., authorities to proceed), within the agile framework, to determine readiness to enter into the applicable phase of the acquisition process. Unified Platform will utilize both new and existing contractual vehicles, such as Government-Wide Acquisition Contract (GWAC) vehicles (Alliant, Encore II, Solutions for Enterprise-Wide Procurement IV (SEWP IV), and General Services Administration (GSA) Federal Supply Schedules and a new Cyber Indefinite Delivery Indefinite Quantity (IDIQ) contract. The use of multiple-award contractual vehicles will provide a wide range of commercially-available products and services that can meet many requirements related to Unified Platform. These multiple-award contractual vehicles have already met the statutory requirements of the Competition in Contracting Act (CICA); they require a fair opportunity to all contract holders, in accordance with Federal Acquisition Regulation (FAR) 16.505, unless an exception to fair opportunity applies.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|--|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0208099F / <i>Unified Platform (UP)</i> | Project (Number/Name) 646504 / <i>AF Prototyping</i> |
|--|--|--|

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
|------------------------------|------------|
| <i>AF Prototyping</i> | |
| Agile Capability Prototyping | [REDACTED] |

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|--|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0208099F / <i>Unified Platform (UP)</i> | Project (Number/Name) 646504 / <i>AF Prototyping</i> |
|--|--|--|

Schedule Details

| Events by Sub Project | Start | | End | |
|------------------------------|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>AF Prototyping</i> | | | | |
| Agile Capability Prototyping | 1 | 2019 | 4 | 2021 |

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|--|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0208099F / <i>Unified Platform (UP)</i> | Project (Number/Name) 646505 / <i>USCYBERCOM Prototyping</i> |
|--|--|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---------------------------------------|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| 646505: <i>USCYBERCOM Prototyping</i> | - | 0.000 | 10.000 | 5.000 | 0.000 | 5.000 | 3.000 | 0.000 | 0.000 | 0.000 | 0.000 | 18.000 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

U.S. Cyber Command's (USCYBERCOM) mission is to deter or defeat strategic cyber threats to US interests and infrastructure, provide mission assurance for the operations and defense of the Department of Defense information environment, and support the achievement of Combatant Commander and Joint Force Commander Objectives.

The rapidly evolving cyberspace domain demands highly flexible requirements, acquisition activities, and operations to respond to emerging opportunities or mitigate adversary actions. Salient to this mission area, rapid prototyping activities provide the structure to rapidly develop, evaluate, and integrate new cyber capabilities and inform the initial Unified Platform capability baseline during the early stages of technology maturation and delivery. USCYBERCOM Prototyping efforts support this need through the focus on the rapid and exploratory research, prototype development, risk reduction, testing, and integration of cyber capabilities contributing to early operational development of the Unified Platform capability baseline. USCYBERCOM in conjunction with the Services and National Agencies execute operationally focused research and development and rapid prototyping to explore and determine validity of potential infrastructure, architectures, and capabilities/tools to support Cyber Mission Forces. These rapid prototyping efforts will be tailored for near-immediate integration into the Unified Platform baseline (BA 7, PE 0208099F Unified Platform, BPAC 672281F Foundational Efforts) for delivery to cyber warfighters.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver Unified Platform weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, 0605898F, and 0605833F.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|---|---------|---------|---------|
| Title: USCYBERCOM Prototyping | 0.000 | 10.000 | 5.000 |
| Description: Funding supports USCYBERCOM prototyping efforts associated with the research, development, and integration of cyber technologies supporting the Unified Platform program. | | | |
| FY 2019 Plans: - Deliver prototyping efforts in support of Unified Platform program. | | | |
| - The origin, details, and specific aspects of these efforts are classified and will be provided on a need-to-know basis. | | | |
| FY 2020 Plans: - Will continue to conduct prototyping efforts in support of Unified Platform program. | | | |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0208099F / <i>Unified Platform (UP)</i> | Project (Number/Name) 646505 / <i>USCYBERCOM Prototyping</i> |

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| - The origin, details, and specific aspects of these efforts are classified and will be provided on a need-to-know basis. | | | |
| <i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> Funding decreased due to integration of USCYBERCOM prototyping efforts into Unified Platform baseline and reduction of rapid prototyping activity | | | |
| Accomplishments/Planned Programs Subtotals | 0.000 | 10.000 | 5.000 |

C. Other Program Funding Summary (\$ in Millions)

| Line Item | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|----------------|----------------|-------------------------|------------------------|--------------------------|----------------|----------------|----------------|----------------|-----------------------------|-------------------|
| • RDTE 07 0208099F: <i>Unified Platform (UP)</i> | - | 26.559 | 84.709 | - | 84.709 | 98.701 | 114.713 | 114.721 | 125.436 | Continuing | Continuing |
| • OPAF 03 835080: <i>AFNET</i> | - | - | 4.963 | - | 4.963 | 4.964 | 4.962 | 4.961 | 5.050 | Continuing | Continuing |

Remarks

D. Acquisition Strategy

Unified Platform represents a flexible, interoperable, and scalable warfighter capability to be employed by the Army, Navy, Marine Corps, and Air Force in conjunction with U.S. Cyber Command (USCYBERCOM). In order to match the speed of need of the highly dynamic cyberspace domain, the Service-agnostic Unified Platform capability implements a scaled agile development framework (SAFe) to facilitate the rapid development, integration, and fielding of capabilities to remain responsive to evolving warfighter requirements. The Unified Platform program executes the agile development requirements provided by the Army, Navy, Marine Corps, Air Force, and USCYBERCOM stakeholders in accordance with the prioritization provided by the multi-Service Unified Platform governance structure.

The initial Unified Platform capability will deliver a minimum viable product (MVP) for immediate deployment and operational use by the Cyber Mission Force. Subsequent build iterations will continue to deliver enhanced capabilities, incrementally building the Unified Platform capability to match warfighter needs and requirements to achieve cyberspace dominance. Early development of the Unified Platform baseline capability relies on extensive rapid prototyping efforts to analyze integration constraints and opportunities of Service-specific cyber capabilities to realize the Unified Platform MVP and inform the future Unified Platform baseline (BA 4, PE 0208099F Unified Platform, 646504 AF Prototyping and 646505 USCYBERCOM Prototyping). In parallel, an enduring foundational Unified Platform thrust area supports the development and maturation of Unified Platform baseline, integrates successful prototyping activities, and implements an agile development/security/operations (DevSecOps) construct to rapidly evolve and enhance the Unified Platform capability to match warfighter requirements (BA 7, PE 0208099F Unified Platform, 672281 Foundational Efforts).

The Unified Platform program office utilizes Concept, Development, Risk management, Production, or Deployment Plans as part of a streamlined approach to agile acquisition planning. All plans contain sufficient information to inform acquisition decisions (i.e., authorities to proceed), within the agile framework, to determine readiness to enter into the applicable phase of the acquisition process. Unified Platform will utilize both new and existing contractual vehicles, such as Government-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force Date: February 2019

| Appropriation/Budget Activity | R-1 Program Element (Number/Name) | Project (Number/Name) |
|-------------------------------|--|--|
| 3600 / 4 | PE 0208099F / <i>Unified Platform (UP)</i> | 646505 / <i>USCYBERCOM Prototyping</i> |

Wide Acquisition Contract (GWAC) vehicles (Alliant, Encore II, Solutions for Enterprise-Wide Procurement IV (SEWP IV), and General Services Administration (GSA) Federal Supply Schedules and a new Cyber Indefinite Delivery Indefinite Quantity (IDIQ) contract. The use of multiple-award contractual vehicles will provide a wide range of commercially-available products and services that can meet many requirements related to Unified Platform. These multiple-award contractual vehicles have already met the statutory requirements of the Competition in Contracting Act (CICA); they require a fair opportunity to all contract holders, in accordance with Federal Acquisition Regulation (FAR) 16.505, unless an exception to fair opportunity applies.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force Date: February 2019

Appropriation/Budget Activity 3600 / 4 R-1 Program Element (Number/Name) PE 0208099F / Unified Platform (UP) Project (Number/Name) 646505 / USCYBERCOM Prototyping

Table with 16 columns: Cost Category Item, Contract Method & Type, Performing Activity & Location, Prior Years, FY 2018 Cost, FY 2018 Award Date, FY 2019 Cost, FY 2019 Award Date, FY 2020 Base Cost, FY 2020 Base Award Date, FY 2020 OCO Cost, FY 2020 OCO Award Date, FY 2020 Total Cost, Cost To Complete, Total Cost, Target Value of Contract. Includes rows for Agile Capability Prototyping and a Subtotal.

Table with 16 columns: Cost Category Item, Contract Method & Type, Performing Activity & Location, Prior Years, FY 2018 Cost, FY 2018 Award Date, FY 2019 Cost, FY 2019 Award Date, FY 2020 Base Cost, FY 2020 Base Award Date, FY 2020 OCO Cost, FY 2020 OCO Award Date, FY 2020 Total Cost, Cost To Complete, Total Cost, Target Value of Contract. Includes rows for Systems Engineering, Acquisition Support, and a Subtotal.

Summary table with 11 columns: Prior Years, FY 2018, FY 2019, FY 2020 Base, FY 2020 OCO, FY 2020 Total, Cost To Complete, Total Cost, Target Value of Contract. Row for Project Cost Totals.

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force **Date:** February 2019

| | | |
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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0208099F / <i>Unified Platform (UP)</i> | Project (Number/Name) 646505 / <i>USCYBERCOM Prototyping</i> |
|--|--|--|

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
|--------------------------------------|------------|
| <i>USCYBERCOM Prototyping</i> | |
| Agile Capability Prototyping | [REDACTED] |

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0208099F / <i>Unified Platform (UP)</i> | Project (Number/Name) 646505 / <i>USCYBERCOM Prototyping</i> |
|--|--|--|

Schedule Details

| Events by Sub Project | Start | | End | |
|--------------------------------------|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>USCYBERCOM Prototyping</i> | | | | |
| Agile Capability Prototyping | 1 | 2019 | 4 | 2021 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0305236F / <i>Common Data Link Executive Agent (CDL EA)</i> |
|--|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---------------------------------------|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 40.838 | 41.880 | 36.910 | 0.000 | 36.910 | 43.537 | 44.439 | 45.249 | 31.862 | Continuing | Continuing |
| 641334: <i>Common Data Link (CDL)</i> | - | 40.838 | 41.880 | 36.910 | 0.000 | 36.910 | 43.537 | 44.439 | 45.249 | 31.862 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

Common Data Link Executive Agent (CDL EA) provides the DoD standard for interoperable, multi-service, multi-agency, Intelligence, Surveillance, and Reconnaissance (ISR) datalinks for 10,000+ DoD manned/unmanned airborne and ground platforms. As the DoD CDL EA, the Air Force is responsible for cross-service application of CDL RDT&E Military Intelligence Program (MIP) funds facilitating compliance to Congressional and DoD mandates. The CDL EA develops, modifies, distributes, and maintains specifications for the CDL waveform family; ensuring design configuration control, commonality, and interoperability among ISR platforms. Additionally, funds support managing resources allocated for development, maturation, and migration of CDL technologies.

CDL EA enables compliance with OSD and Congressional mandates to effectively utilize spectrum, use approved cryptographic equipment, and provide direct support to current operations. CDL is a vital link in DoD's existing and emerging communication architectures, providing flexibility to accommodate Command and Control (C2) data and myriad types of Signals Intelligence (SIGINT), Geospatial Intelligence (GEOINT), and Full-Motion Video (FMV) data. The CDL specifications permit current and future ISR asset operations worldwide by providing sensor data directly via point-to-point and broadcast to ground sites, airborne platforms and dismounted users. Also, CDL provides the capability to relay data via air-to-air or compatible satellite links when the asset and ground site are not in line-of-sight.

CDL EA's research and development activities support a broad array of tactical, operational, and strategic ISR users and include achieving higher data rates, open architecture development, multi-access and multi-node network management, cryptographic modernization, advancements needed to operate in contested environments, terminal and antenna design enhancements, operations in other spectral bands, and improving spectrum efficiency. Further, CDL development improves large area surveillance missions while supporting continuous improvements and implementation of line-of-sight platform and CDL terminal Command and Control (C2), plus increased ISR (C2ISR) capabilities. Activities also include studies and analysis to support current and future requirements documentation, program planning and execution. CDL prototype terminal designs provide for future technology insertion and reduce non-recurring engineering and life-cycle costs to the user.

In addition, the Cryptographic Core Modernization (CCM) thrust enables CDL to develop a miniaturized gigabit rate Communications Security (COMSEC) device capable of managing CDL data. The miniaturized COMSEC device will allow faster throughput while reducing Size, Weight, and Power (SWaP) requirements.

The FY 2020 funding request was reduced by \$5.798 million to account for the availability of prior year execution balances.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0305236F / <i>Common Data Link Executive Agent (CDL EA)</i> |
|--|--|

This program element may include necessary civilian pay expenses required to manage, execute, and deliver CDL Executive Agent capabilities. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, and 0605898F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 41.509 | 41.880 | 42.708 | 0.000 | 42.708 |
| Current President's Budget | 40.838 | 41.880 | 36.910 | 0.000 | 36.910 |
| Total Adjustments | -0.671 | 0.000 | -5.798 | 0.000 | -5.798 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | -0.671 | 0.000 | -5.798 | 0.000 | -5.798 |

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Title: Common Data Link (CDL) Technology Advancement | 10.000 | 10.165 | 17.010 | 0.000 | 17.010 |
| Description: CDL evolutionary concept development, exploratory prototyping, advanced technology demonstrations, and studies of emerging technologies and capability gaps. | | | | | |
| FY 2019 Plans: | | | | | |
| - Continue to research and evaluate technology developments for enhancing the CDL enterprise networking architecture, to include network management devices, applications and advanced algorithms | | | | | |
| - Continue to research, evaluate and develop an Open Systems Architecture with Common Control Interface (CCI) standards to improve CDL enterprise interoperability and security | | | | | |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0305236F / <i>Common Data Link Executive Agent (CDL EA)</i> |
|--|--|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|---------|---------|--------------|-------------|---------------|
| <ul style="list-style-type: none"> - Continue to research, evaluate and develop more spectrally efficient waveforms to support Combatant Command demand for higher bandwidth transmission and improved jam resistant capabilities - Continue exploratory prototyping efforts and advanced technology demonstrations in support of emerging communication backbone architecture development across air, space and terrestrial layers, to include agile high capacity data transport, assured communications and multi-mode access networks - Continue to research and evaluate technology developments for the reduction of size, weight and power (SWaP) for air, space and terrestrial terminal components - Continue development of enhanced, CDL-based Intelligence, Surveillance and Reconnaissance (ISR) communication capabilities across multiple platforms and echelons among U.S and allied partners - Continue development of a CDL Collaborative Application Space (C-CAS) as it applies to CDL Family of Waveform Specification maintenance, update and advancement - Continue to research and develop upgrades to support current and future specification employment profiles that deliver flexible waveform modes to support high data rates, antenna configuration, network management, fast network reconfiguration, and improve jam resistant capabilities - Continue to research and evaluate developing Artificial Intelligence (AI) technologies to support faster correlation and fusion of ISR and CDL network management processes - Continue to research and evaluate developing modeling and simulation technologies to support improved CDL enterprise advancement - Continue to research and evaluate developing technologies to minimize the National Security Agency (NSA) required certification requirements for terminals while standardizing Communications Security (COMSEC) implementation <p>FY 2020 Base Plans:</p> <ul style="list-style-type: none"> - Will continue to research and evaluate technology developments for enhancing the CDL enterprise networking architecture, to include network management devices, applications and advanced algorithms - Will continue to research, evaluate and develop an Open Systems Architecture with Common Control Interface (CCI) standards to improve CDL enterprise interoperability and security - Will continue to research, evaluate and develop more spectrally efficient waveforms to support Combatant Command demand for higher bandwidth transmission and improved jam resistant capabilities - Will continue exploratory prototyping efforts and advanced technology demonstrations in support of emerging communication backbone architecture development across air, space and terrestrial layers, to include agile high capacity data transport, assured communications and multi-mode access networks | | | | | |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0305236F / <i>Common Data Link Executive Agent (CDL EA)</i> |
|--|--|

C. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|---------|---------|--------------|-------------|---------------|
| <ul style="list-style-type: none"> - Will continue to research and evaluate technology developments for the reduction of size, weight and power (SWaP) for air, space and terrestrial terminal components - Will continue development of enhanced, CDL-based Intelligence, Surveillance and Reconnaissance (ISR) communication capabilities across multiple platforms and echelons among U.S and allied partners - Will continue development of a CDL Collaborative Application Space (C-CAS) as it applies to CDL Family of Waveform Specification maintenance, update and advancement - Will continue to research and develop upgrades to support current and future specification employment profiles that deliver flexible waveform modes to support high data rates, antenna configuration, network management, fast network reconfiguration, and improve jam resistant capabilities - Will continue to research and evaluate developing Artificial Intelligence (AI) technologies to support faster correlation and fusion of ISR and CDL network management processes - Will continue to research and evaluate developing modeling and simulation technologies to support improved CDL enterprise advancement - Will continue to research and evaluate developing technologies to minimize the National Security Agency (NSA) required certification requirements for terminals while standardizing Communications Security (COMSEC) implementation <p>FY 2020 OCO Plans: Not Applicable</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Increase in FY20 funding due to inflation adjustment.</p> | | | | | |
| <p>Title: Common Data Link (CDL) Specification Development, Validation, Test and Maintenance</p> <p>Description: Systems engineering lifecycle for CDL and NATO STANAG 7085 specification development: requirement decomposition, specification development (modeling, maturation, documentation), specification validation (and associated component prototyping), testing, configuration management, and process maintenance.</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none"> - Continue development and testing of Higher Data Rate technology solutions, prototyping terminal development that combines Size, Weight and Power (SWaP) improvements whenever feasible | 24.019 | 24.715 | 13.800 | 0.000 | 13.800 |

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0305236F / <i>Common Data Link Executive Agent (CDL EA)</i> |
|--|--|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|---------|---------|--------------|-------------|---------------|
| <ul style="list-style-type: none"> - Continue adding capabilities required to support the Joint Aerial Layer Network (JALN) High Capacity Backbone (HCB) development, Low Probability of Detect (LPD)/Low Probability of Intercept(LPI)/Anti-Jam (AJ) capabilities to better operate in future Anti-Access/Area-Denial(A2/AD) airspace - Commence evaluation, analysis and study of multi-beam airborne antenna technology to further improve CDL networking and LPD/LPI/AJ capabilities - Continue evaluation, analysis and study of network management devices, network and waveform configuration tool development; transition improved technologies into CDL Specification baseline that increases data sharing across Service-specific networks - Commence evaluation, analysis and study of Artificial Intelligence (AI) and advanced algorithm technologies that can assist in enabling CDL network discovery, spectrum efficient communications, near-optimal network topology formation and resource allocation for future ad hoc, near-mesh and mesh networks - Continue evaluating developing technology solutions that improve CDL data transmissions rates at lower power levels - Continue development and advancement of spectrally efficient CDL waveform specification(s) - Continue to work with CDL industry partners and DoD Services and Agencies to document, validate and implement common terminal control interfaces through use of commercially recognized standards - Continue configuration control of the CDL architecture, standards, specifications and modules - Continue development of CDL test equipment capable of compliance testing to the latest, validated version of CDL specifications <p>FY 2020 Base Plans:</p> <ul style="list-style-type: none"> - Will continue development and testing of Higher Data Rate technology solutions, prototyping terminal development that combines Size, Weight and Power (SWaP) improvements whenever feasible - Will continue adding capabilities required to support the Joint Aerial Layer Network (JALN) High Capacity Backbone (HCB) development, Low Probability of Detect (LPD)/Low Probability of Intercept(LPI)/Anti-Jam (AJ) capabilities to better operate in future Anti-Access/Area-Denial(A2/AD) airspace - Will commence evaluation, analysis and study of multi-beam airborne antenna technology to further improve CDL networking and LPD/LPI/AJ capabilities - Will continue evaluation, analysis and study of network management devices, network and waveform configuration tool development; transition improved technologies into CDL Specification baseline that increases data sharing across Service-specific networks | | | | | |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0305236F / <i>Common Data Link Executive Agent (CDL EA)</i> |
|--|--|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|---------|---------|--------------|-------------|---------------|
|---|---------|---------|--------------|-------------|---------------|

- Will commence evaluation, analysis and study of Artificial Intelligence (AI) and advanced algorithm technologies that can assist in enabling CDL network discovery, spectrum efficient communications, near-optimal network topology formation and resource allocation for future ad hoc, near-mesh and mesh networks

- Will continue evaluating developing technology solutions that improve CDL data transmissions rates at lower power levels

- Will continue development and advancement of spectrally efficient CDL waveform specification(s)

- Will continue to work with CDL industry partners and DoD Services and Agencies to document, validate and implement common terminal control interfaces through use of commercially recognized standards

- Will continue configuration control of the CDL architecture, standards, specifications and modules

- Will continue development of CDL test equipment capable of compliance testing to the latest, validated version of CDL specifications

FY 2020 OCO Plans:
Not Applicable

FY 2019 to FY 2020 Increase/Decrease Statement:
Increase in FY20 funding due to inflation adjustment.

| | | | | | |
|--|-------|-------|-------|-------|-------|
| <p>Title: Common Data Link (CDL) Cryptographic Modernization</p> <p>Description: Phased development effort to modernize CDL Communications Security (COMSEC) devices and standards to maximize performance and reduce SWaP requirements while supporting interoperability, commonality, modularity, portability, remote management, multi-level security and releasability.</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none"> - Complete development of generation two (Gen 2) Nano and Mini cryptographic core modernization (CCM) modules for US and NATO release - Complete Nano and Mini CCM Security Validation Testing (SVT) and subsequent National Security Agency (NSA) information assurance (IA) certification - Continue development of multi-channel, gigabit data rate (Mega) cryptographic cores with Gen 2 advances - Continue development and design of common End Cryptographic Units (ECUs) for use with medium- and large-sized ISR terminals - Continue advancement of standardized CCM interface specifications for modularity to ease future systems upgrades, facilitate competitive terminal procurements, promote innovation, and maintain backward compatibility with existing Intelligence, Surveillance and Reconnaissance (ISR) systems | 6.819 | 7.000 | 6.100 | 0.000 | 6.100 |
|--|-------|-------|-------|-------|-------|

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|--|--|

C. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|--|---------|---------|--------------|-------------|---------------|
| <ul style="list-style-type: none"> - Continue development, advancement and instantiation of CCM algorithms to support FIVE EYE (FVEY), North Atlantic Treaty Organization (NATO) and Coalition operations for secure encrypted and interoperable ISR data exchange among allied and partner nations - Continue participating in FVEY, NATO and Coalition forums, testing venues and exercises (including live-fly) to ensure secure encrypted and interoperable ISR data exchange among allied and partner nations <p>FY 2020 Base Plans:</p> <ul style="list-style-type: none"> - Will develop software and firmware upgrades for generation two (Gen 2) Nano and Mini cryptographic core modernization (CCM) modules for US and NATO release - Will submit Engineering Change Proposals (ECP) for Nano and Mini CCM Security Validation Testing (SVT) and subsequent National Security Agency (NSA) information assurance (IA) certification - Will continue development of multi-channel, gigabit data rate (Mega) cryptographic cores with Gen 2 advances - Will continue development and design of common End Cryptographic Units (ECUs) for use with medium- and large-sized ISR terminals - Will continue advancement of standardized CCM interface specifications for modularity to ease future systems upgrades, facilitate competitive terminal procurements, promote innovation, and maintain backward compatibility with existing Intelligence, Surveillance and Reconnaissance (ISR) systems - Will continue development, advancement and instantiation of CCM algorithms to support FIVE EYE (FVEY), North Atlantic Treaty Organization (NATO), and Coalition operations for secure encrypted and interoperable ISR data exchange among allied and partner nations - Will continue participating in FVEY, NATO and Coalition forums, testing venues and exercises (including live-fly) to ensure secure encrypted and interoperable ISR data exchange among allied and partner nations <p>FY 2020 OCO Plans: Not Applicable</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Increase in FY20 funding due to inflation adjustment.</p> | | | | | |
| Accomplishments/Planned Programs Subtotals | 40.838 | 41.880 | 36.910 | 0.000 | 36.910 |

D. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force Date: February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0305236F / <i>Common Data Link Executive Agent (CDL EA)</i> |
|--|--|

E. Acquisition Strategy
The Air Force serves as the DoD Common Data Link Executive Agent, with support from each Service's designated CDL lead and the Airborne Network Division (AFLCMC/HNA). The CDL EA develops interoperable ISR data links mandated for use by Assistant Secretary of Defense (Networks and Information Integration) (ASD(NII)) policy. Once CDL technology development matures and a specification is published, services are responsible for CDL compliant platform and terminal procurement; National Security Agency (NSA) and Joint Interoperability Test Command (JITC) ensure compliance certifications; integration; and installation. Acquisition strategy varies by contract. Whenever possible, contracts are awarded under full and open competition.

F. Performance Metrics
Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0305236F / <i>Common Data Link Executive Agent (CDL EA)</i> | Project (Number/Name) 641334 / <i>Common Data Link (CDL)</i> |
|--|--|--|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | | | |
|--|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | Target Value of Contract |
| Air Force Information Assurance Modernization / Network Management | MIPR | NSA : Ft Meade, MD | - | 7.000 | Jan 2018 | 7.000 | Jan 2019 | 6.100 | Nov 2019 | - | | 6.100 | Continuing | Continuing | - |
| Generic ECU | C/Various | MIT/LL : TBD | - | - | | - | | 1.250 | Dec 2019 | - | | 1.250 | Continuing | Continuing | - |
| Air Force Network Modernization | MIPR | Air Force : Various | - | 7.000 | Nov 2017 | 5.000 | Nov 2018 | 1.200 | Jan 2020 | - | | 1.200 | Continuing | Continuing | - |
| Marine CDL for Tactical UAS | Various | Various : Various | - | 0.000 | | - | | - | | - | | - | Continuing | Continuing | - |
| Terminal Database | C/CPFF | Booze Allen : McClean, VA | - | 0.700 | Nov 2017 | 0.700 | Nov 2018 | 0.700 | Dec 2019 | - | | 0.700 | Continuing | Continuing | - |
| Compliance Test Tool | C/Various | Various : Various | - | 3.000 | Mar 2018 | 3.000 | Mar 2019 | 1.540 | Feb 2020 | - | | 1.540 | Continuing | Continuing | - |
| Under Threshold Combined | Various | Various : Various | - | 4.981 | Nov 2017 | 5.131 | Nov 2018 | 1.872 | Jan 2020 | - | | 1.872 | Continuing | Continuing | - |
| A2AD Waveform Analysis Demo | C/CPAF | Various : Various | - | - | | - | | 6.325 | Jan 2020 | - | | 6.325 | Continuing | Continuing | - |
| Navy Multi Beam | C/Various | Navy : Various | - | - | | - | | 1.200 | Jan 2020 | - | | 1.200 | Continuing | Continuing | - |
| BE-CDL SDR | C/Various | AFRL : Various | - | - | | - | | 0.200 | Dec 2019 | - | | 0.200 | Continuing | Continuing | - |
| Subtotal | | | - | 22.681 | | 20.831 | | 20.387 | | - | | 20.387 | Continuing | Continuing | N/A |

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | | | |
|---|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | Target Value of Contract |
| Service Tech Support & Spec Development | MIPR | Various : Various | - | 8.900 | Dec 2017 | 9.000 | Dec 2018 | 5.725 | Nov 2019 | - | | 5.725 | Continuing | Continuing | - |
| Subtotal | | | - | 8.900 | | 9.000 | | 5.725 | | - | | 5.725 | Continuing | Continuing | N/A |

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0305236F / <i>Common Data Link Executive Agent (CDL EA)</i> | Project (Number/Name) 641334 / <i>Common Data Link (CDL)</i> |
|--|--|--|

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Joint Interoperability Test Center (JITC) | MIPR | JITC : Ft Huachuca, AZ | - | 0.800 | Mar 2018 | 1.000 | Mar 2019 | 0.800 | Feb 2020 | - | | 0.800 | Continuing | Continuing | - |
| 46 Test Squadron | PO | 46 TS/OGEX : Eglin AFB, FL | - | 0.369 | Nov 2017 | 0.369 | Nov 2018 | 0.318 | Mar 2020 | - | | 0.318 | Continuing | Continuing | - |
| Subtotal | | | - | 1.169 | | 1.369 | | 1.118 | | - | | 1.118 | Continuing | Continuing | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| PMA-MITRE Engineering Support (FFRDC) | SS/T&M | MITRE Corp : Bedford, MA | - | 0.000 | | - | | - | | - | | - | Continuing | Continuing | - |
| PMO/Service- MITRE Engineering Direct Mission Support (FFRDC) | SS/T&M | MITRE Corp. : Bedford, MA | - | 5.650 | Nov 2017 | 5.650 | Nov 2018 | 5.521 | Oct 2019 | - | | 5.521 | Continuing | Continuing | - |
| PMA - PMO Support (A&AS) | C/CPFF | PE Systems : Littleton, MA | - | 0.860 | Jul 2018 | 0.860 | Jul 2019 | 1.250 | Nov 2019 | - | | 1.250 | Continuing | Continuing | - |
| PMA - Under Threshold Program Mgmt/Tech Support | Various | Various : Various | - | 1.578 | Dec 2017 | 4.170 | Dec 2018 | 2.909 | Dec 2019 | - | | 2.909 | Continuing | Continuing | - |
| Subtotal | | | - | 8.088 | | 10.680 | | 9.680 | | - | | 9.680 | Continuing | Continuing | N/A |

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract | |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|-----|
| Project Cost Totals | | - | 40.838 | 41.880 | 36.910 | - | 36.910 | Continuing | Continuing | N/A |

Remarks

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0305236F / <i>Common Data Link Executive Agent (CDL EA)</i> | Project (Number/Name) 641334 / <i>Common Data Link (CDL)</i> |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| Common Data Link | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CDL Technology Advancement | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| - Spectrum efficient/Frequency agile CDL | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| - Capability Gap Analysis / Roadmap Update | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| - Multi-access / Mesh Network Advancements | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CDL Specification Development, Validation, Test and Maintenance | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| - SUAS SWAP Constrained Rev B Terminals | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| - CDL Compliance Test Set | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CDL Cryptographic Modernization | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| - Multi-algorithm US/Coalition crypto core modules (Generation 2) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| - End Cryptographic Unit (ECUs) design | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0305236F / <i>Common Data Link Executive Agent (CDL EA)</i> | Project (Number/Name) 641334 / <i>Common Data Link (CDL)</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|---|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| Common Data Link | | | | |
| CDL Technology Advancement | 1 | 2018 | 4 | 2024 |
| - Spectrum efficient/Frequency agile CDL | 1 | 2018 | 4 | 2022 |
| - Capability Gap Analysis / Roadmap Update | 1 | 2018 | 3 | 2019 |
| - Multi-access / Mesh Network Advancements | 1 | 2018 | 4 | 2024 |
| CDL Specification Development, Validation, Test and Maintenance | 1 | 2018 | 4 | 2024 |
| - SUAS SWAP Constrained Rev B Terminals | 1 | 2018 | 4 | 2019 |
| - CDL Compliance Test Set | 1 | 2018 | 4 | 2020 |
| CDL Cryptographic Modernization | 1 | 2018 | 4 | 2022 |
| - Multi-algorithm US/Coalition crypto core modules (Generation 2) | 1 | 2018 | 3 | 2019 |
| - End Cryptographic Unit (ECUs) design | 3 | 2018 | 4 | 2020 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0305251F / <i>Cyberspace Operations Forces and Force Support</i> |
|--|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|--|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 0.000 | 0.000 | 35.000 | 0.000 | 35.000 | 43.000 | 44.000 | 45.000 | 45.000 | Continuing | Continuing |
| 646008: <i>US Cyber Command Technology Development</i> | - | 0.000 | 0.000 | 35.000 | 0.000 | 35.000 | 43.000 | 44.000 | 45.000 | 45.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

Note
This program, BA 4, PE 0305251F, project 646008, CMF Foundational Tools, is a new start.

A. Mission Description and Budget Item Justification

Foundational Tools provide advanced cyber warfare capabilities to the Air Force Cyber Mission Forces in direct support of US Cyber Command (USCYBERCOM), AF Major Commands (MAJCOMs), unified commands, and national agency cyber warfighting requirements. Activities within the program deliver operations-ready cyberspace superiority capabilities through the research, development, testing, evaluation, accelerated prototyping, demonstration, and fielding of cyber technologies and capabilities. This program enables Combatant Commanders the ability to operate in and through cyberspace to manipulate, disrupt, deny, degrade, or destroy targeted computers, information systems, and networks.

Capabilities prototyped and developed in this program are incorporated into the Air Force Distributed Cyber Warfare Operations (DCWO) portfolio. The DCWO portfolio enables delivery of cyber effects to Combatant Commanders to include cyber operational preparation of the environment, offensive counter-cyber, cyber-attack, electronic warfare operations, mission planning, intelligence, cybersecurity products and services and Command and Control/Situational Awareness (C2SA) tools needed to attack enemy networks, telephony, Integrated Air Defense Systems (IADS), command and control systems, and create cyber effects through the Electromagnetic Spectrum (EMS).

This program element may include necessary civilian pay expenses required to manage, execute, and deliver CMF Foundational Tool capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, 0605898F, and 0605833F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|--|
| Appropriation/Budget Activity 3600: Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P) | R-1 Program Element (Number/Name) PE 0305251F I Cyberspace Operations Forces and Force Support |
|---|--|

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Current President's Budget | 0.000 | 0.000 | 35.000 | 0.000 | 35.000 |
| Total Adjustments | 0.000 | 0.000 | 35.000 | 0.000 | 35.000 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 35.000 | 0.000 | 35.000 |

Change Summary Explanation

FY20 increase for new start of Air Force CMF Foundational Tool program.

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| Title: CMF Foundational Tools | 0.000 | 0.000 | 35.000 |
| Description: The CMF Foundational Tools program develops a family of foundational cyber tool prototypes at scale ready for integration and operational test in the Distributed Cyber Warfare Operations (DCWO) portfolio. This effort equips the Air Force portion of the Cyber Mission Force support strategy, and significantly leverages joint partnerships with US Cyber Command, other service development offices, and other government agencies. Details of specific tool development efforts are classified and will be provided on a need to know basis. For further information please contact AFLCMC/HNCO, 210-925-6653. | | | |
| FY 2019 Plans: N/A | | | |
| FY 2020 Plans: | | | |
| - Will expand FY18-FY19 USCYBERCOM-funded efforts to produce prioritized family of foundational tools | | | |
| - Will develop additional tool development software factories | | | |
| - Will transition and integrate available prototype tool kits to DCWO portfolio | | | |
| - Will deliver prototype tools into USCYBERCOM architecture to ensure interoperability | | | |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0305251F / <i>Cyberspace Operations Forces and Force Support</i> |
|--|---|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|---------|---------|---------|
| - Will develop automated testing and information assurance support tools | | | |
| <i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> This program leverages previous USCYBERCOM and Air Force foundational tool development efforts. These efforts were funded in other programs and the FY20 funds in this program will address the expanded Air Force requirement to deliver diverse Cyber Mission Force foundational tools. | | | |
| Accomplishments/Planned Programs Subtotals | 0.000 | 0.000 | 35.000 |

D. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

E. Acquisition Strategy

The CMF foundational tools program is aligned within the Distributed Cyber Warfare Operations (DCWO) program office. This program serves to create foundational tool prototypes at scale to enable the DCWO program office to quickly integrate and transition those tools into available operational capability. The foundational tools program office will utilize Concept, Development, Risk Management, Production, or Deployment Plans as part of a streamlined approach to acquisition planning. All plans will contain sufficient information for the Milestone Decision Authority (MDA) to determine readiness to enter into the applicable phase of the acquisition process. Foundational Tools prototyping efforts will be used in conjunction with the DCWO program to buy-down acquisitions risk and identify both new large-scale foundational efforts as well as short projects to leverage government and commercial solutions. The program will utilize both new and existing contractual vehicles, such as Government-Wide Acquisition Contract (GWAC) vehicles (Alliant, Encore II, Solutions for Enterprise-Wide Procurement IV (SEWP IV)), and General Services Administration (GSA) Federal Supply Schedules and a Cyber Indefinite Delivery Indefinite Quantity (IDIQ) contract. The use of multiple-award contractual vehicles will provide a wide range of commercially-available products and services that should be able to meet many requirements related to Offensive Cyberspace Operations. These multiple-award contractual vehicles have already met the statutory requirements of the Competition in Contracting Act (CICA), which requires a fair opportunity to all contract holders, in accordance with Federal Acquisition Regulation (FAR) 16.505, unless an exception to fair opportunity applies.

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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| Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force | | | | | | | | | | | | Date: February 2019 | | | |
|---|------------------------|--------------------------------|-------------|--|------------|---------|------------|--|------------|-------------|------------|---------------------|------------------|------------|--------------------------|
| Appropriation/Budget Activity | | | | R-1 Program Element (Number/Name) | | | | Project (Number/Name) | | | | | | | |
| 3600 / 4 | | | | PE 0305251F / Cyberspace Operations Forces and Force Support | | | | 646008 / US Cyber Command Technology Development | | | | | | | |
| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | | | |
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | Target Value of Contract |
| CMF Foundational Tool Development | Various | Various : Various | - | - | | - | | 22.200 | Jan 2020 | - | | 22.200 | Continuing | Continuing | - |
| Interoperability Development | Various | Various : Various | - | - | | - | | 3.100 | Feb 2020 | - | | 3.100 | Continuing | Continuing | - |
| Automated Test Development | Various | Various : Various | - | - | | - | | 3.000 | Jan 2020 | - | | 3.000 | Continuing | Continuing | - |
| Subtotal | | | - | - | | - | | 28.300 | | - | | 28.300 | Continuing | Continuing | N/A |
| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | | | |
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | Target Value of Contract |
| CMF Foundational Tool Testing | MIPR | 47 CTS : San Antonio, TX | - | - | | - | | 2.900 | Jan 2020 | - | | 2.900 | Continuing | Continuing | - |
| Subtotal | | | - | - | | - | | 2.900 | | - | | 2.900 | Continuing | Continuing | N/A |
| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | | | |
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | Target Value of Contract |
| CMF Foundational Tool PSC (A&AS, FFRDC) | C/Various | Various : Various | - | - | | - | | 3.800 | Jan 2020 | - | | 3.800 | Continuing | Continuing | - |
| Subtotal | | | - | - | | - | | 3.800 | | - | | 3.800 | Continuing | Continuing | N/A |
| Project Cost Totals | | | - | - | | 0.000 | | 35.000 | | - | | 35.000 | Continuing | Continuing | N/A |
| Remarks | | | | | | | | | | | | | | | |

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0305251F / <i>Cyberspace Operations Forces and Force Support</i> | Project (Number/Name) 646008 / <i>US Cyber Command Technology Development</i> |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|-----------------------------------|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| CMF Foundational Tools | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CMF Foundational Tool Development | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Interoperability Development | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Automated Test Development | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0305251F / <i>Cyberspace Operations Forces and Force Support</i> | Project (Number/Name) 646008 / <i>US Cyber Command Technology Development</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--------------------------------------|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>CMF Foundational Tools</i> | | | | |
| CMF Foundational Tool Development | 2 | 2020 | 4 | 2024 |
| Interoperability Development | 2 | 2020 | 4 | 2021 |
| Automated Test Development | 2 | 2020 | 4 | 2021 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0305601F / <i>Mission Partner Environments</i> |
|--|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|----------------------------------|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 0.000 | 10.074 | 8.550 | 0.000 | 8.550 | 9.076 | 9.593 | 10.582 | 10.772 | Continuing | Continuing |
| 643783: <i>CENTRIXs Networks</i> | - | 0.000 | 10.074 | 8.550 | 0.000 | 8.550 | 9.076 | 9.593 | 10.582 | 10.772 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

Note

Program transitioned from Defense Information Systems Agency (DISA) to USAF in FY19.
 PE 0305601F (Mission Partner Environment), changed from PE 0301144K, (Joint/Allied Coalition Information Sharing).
 Project 643783 (CENTRIXs Networks), changed from Project NND (Multinational Information Sharing).

A. Mission Description and Budget Item Justification

Mission Partner Environment (MPE) enables secure sharing of operational information for collaboration between and among the U.S. and mission partners to include federal, State, local, and tribal agencies, allies, coalition members, host nations, and other nations, United States and international Non-Governmental Organizations, multinational treaty organizations, and private sector organizations. The MPE program enables the United States (US) Department of Defense (DoD) to execute its assigned missions with mission partners across the complete ranges and phases of military operations to assist combined command and control (C2) of coalition forces while meeting the information sharing requirements within existing bi-lateral and multi-lateral agreements. Also, it promotes effective information exchange and provides applications to enable effective use of the United States and Partner nation military power. MPE provides the warfighter mission with technology to improve mission effectiveness and cyber security.

Funding for Mission Partner Environment transferred the capabilities to the Combined Enterprise Regional Information Exchange System (CENTRIXS), Pegasus, the Multinational Information Sharing (MNIS) program, the All Partners Access Network (APAN), and the Combined Federal Battle Labs Network (CFBLNet) to the Mission Partner Environment Program. MPE enables secure sharing of operational information and enhances collaboration between the US forces, and trusted allies and other multinational partners. This effort also increases overall combat effectiveness by leveraging capabilities and information from all partners. FY2020 funding procures hardware and software to support the consolidation of a common mission network capability that supports operations with the Mission Partners Environment.

This funding will deliver procedures, workstations, switches, servers, cross-domain solutions, communications infrastructure, video teleconference suites, network equipment, storage and backup, encryption equipment, software licenses, infrastructure, deployable suites and software communications. Variations in quantity and unit price reflect planned capital investment.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|--|
| Appropriation/Budget Activity 3600: Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P) | R-1 Program Element (Number/Name) PE 0305601F I Mission Partner Environments |
|---|--|

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 0.000 | 10.074 | 8.550 | 0.000 | 8.550 |
| Current President's Budget | 0.000 | 10.074 | 8.550 | 0.000 | 8.550 |
| Total Adjustments | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Change Summary Explanation

FY19 to FY20 funding delta due to initial funding transition profile from DISA for AF standup and executive agent creation in FY19.

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| Title: Mission Partner Environment | 0.000 | 10.074 | 8.550 | 0.000 | 8.550 |
| Description: Program also initiated a capability to support enhancements for the UISS-All Partners Access (APAN). UISS-APAN migrated existing systems supporting coalition sharing to an enterprise solution hosted on a DISA Defense Enterprise Computing Center. UISS-APAN capability will satisfy COCOM needs for tools and technology to support collaboration with non-traditional partners for humanitarian missions. | | | | | |
| FY 2019 Plans: Funds will support development, integration and testing of core C2 mission capabilities, capacities and integration into the cross national, cross organizational, and cross domain accreditation for C2 mission capabilities, and continuity of operations for enterprise services. | | | | | |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|--|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0305601F / <i>Mission Partner Environments</i> |
|--|---|

C. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|---------|---------|--------------|-------------|---------------|
| <p>Work will include the development, integration and testing of an enterprise architectural engineering solution to combine multiple coalition information sharing capabilities into a single Mission Partner Environment, to include modifications necessary to absorb legacy systems capabilities and capacities.</p> <p>FY 2020 Base Plans: Funds will support development, integration and testing of core C2 mission capabilities, capacities and integration into the cross national, cross organizational, and cross domain accreditation for C2 mission capabilities, and continuity of operations for enterprise services.</p> <p>Work will include the development, integration and testing of an enterprise architectural engineering solution to combine multiple coalition information sharing capabilities into a single Mission Partner Environment, to include modifications necessary to absorb legacy systems capabilities and capacities.</p> <p>FY 2020 OCO Plans: N/A.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding delta due to initial funding transition profile from DISA for AF standup and executive agent creation in FY19.</p> | | | | | |
| Accomplishments/Planned Programs Subtotals | 0.000 | 10.074 | 8.550 | 0.000 | 8.550 |

D. Other Program Funding Summary (\$ in Millions)

| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020 Base</u> | <u>FY 2020 OCO</u> | <u>FY 2020 Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To Complete</u> | <u>Total Cost</u> |
|---|----------------|----------------|---------------------|--------------------|----------------------|----------------|----------------|----------------|----------------|-------------------------|-------------------|
| • O&M PE 0305601F: <i>Mission Partner Environment</i> | 0.000 | 95.103 | 81.668 | - | 81.668 | 95.832 | 100.331 | 109.262 | 111.251 | Continuing | Continuing |
| • OPAF 03 0305601F: <i>Mission Partner Environment</i> | 0.000 | 1.873 | 1.585 | - | 1.585 | 1.680 | 1.775 | 1.958 | 1.994 | Continuing | Continuing |

Remarks

Other Procurement funding will:

- Procure the hardware and software needed to establish capabilities as a core infrastructure and enterprise for the Command and Control component of the MPE.
- Procure work stations, enterprise hardware and software, security accreditation, and network connections supporting strategic, operational and forward deployed warfighting forces in multiple theaters.

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0305601F / <i>Mission Partner Environments</i> |
|--|---|

D. Other Program Funding Summary (\$ in Millions)

| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> <u>Base</u> | <u>FY 2020</u> <u>OCO</u> | <u>FY 2020</u> <u>Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To</u> <u>Complete</u> | <u>Total Cost</u> |
|---|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|
| - Provide enhanced capabilities for coalition information sharing capabilities. | | | | | | | | | | | |

E. Acquisition Strategy

Performance-based contracts are primarily used for this support. MNIS maximizes the use of competitive awards and uses various contract types, employs large and small contractors, and is focused to achieve agency socio-economic goals and incorporate DoD acquisition reform initiatives. MNIS evaluates performance by conducting thorough Post-award Contract Reviews, monthly Contract Performance Reviews, and monthly In-Process Reviews.

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0305601F / <i>Mission Partner Environments</i> | Project (Number/Name) 643783 / <i>CENTRIXs Networks</i> |

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

Development, testing of capabilities, and integration of capacities into mission capabilities with continuity of operations for enterprise services

Mission Partner Environment

Development, integration & testing of an architectural engineering solution to combine coalition sharing capabilities into a single environment, to modify legacy systems capabilities and capacities

Mission Partner Environment

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0305601F / <i>Mission Partner Environments</i> | Project (Number/Name) 643783 / <i>CENTRIXs Networks</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Development, testing of capabilities, and integration of capacities into mission capabilities with continuity of operations for enterprise services</i> | | | | |
| Mission Partner Environment | 1 | 2019 | 4 | 2024 |
| <i>Development, integration & testing of an architectural engineering solution to combine coalition sharing capabilities into a single environment, to modify legacy systems capabilities and capacities</i> | | | | |
| Mission Partner Environment | 1 | 2019 | 4 | 2024 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0306250F / <i>Cyber Operations Technology Development</i> |
|--|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|--|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 278.521 | 246.502 | 198.864 | 0.000 | 198.864 | 245.293 | 239.351 | 243.183 | 233.050 | Continuing | Continuing |
| 646008: <i>US Cyber Command Technology Development</i> | - | 278.521 | 246.502 | 198.864 | 0.000 | 198.864 | 245.293 | 239.351 | 243.183 | 233.050 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

Note

In FY2020, elements of PE 0306250F, Cyber Operations Technology Development, Project Joint Common Services efforts were transferred to PE 0208097F, Joint Cyber Command and Control, in order to increase clarity and delineation from other activities.

A. Mission Description and Budget Item Justification

US Cyber Command's (USCYBERCOM) mission is to deter or defeat strategic threats to US interests and infrastructure, provide mission assurance for the operations and defense of the Department of Defense information environment, and support the achievement of Joint Force Commander objectives.

USCYBERCOM in conjunction with the Services and National Agencies will develop and expand infrastructure architectures and capabilities/tools to support Cyber Mission Forces (CMF). Focus is on four broad program areas: Common Services, Access Platforms, Tools, and Analytics.

The specific details and aspects of these cyber activities are classified and will be provided on a need-to-know basis. Please contact USCYBERCOM, 443-634-7769.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0306250F / <i>Cyber Operations Technology Development</i> |
|--|--|

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 322.187 | 253.825 | 248.661 | 0.000 | 248.661 |
| Current President's Budget | 278.521 | 246.502 | 198.864 | 0.000 | 198.864 |
| Total Adjustments | -43.666 | -7.323 | -49.797 | 0.000 | -49.797 |
| • Congressional General Reductions | -31.800 | -7.323 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -9.991 | 0.000 | | | |
| • Other Adjustments | -1.875 | 0.000 | -49.797 | 0.000 | -49.797 |

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| <p>Title: Joint Common Services</p> <p>Description: Funding supports capabilities used in CMF to conduct cyber operations.</p> <p>The origin, details, and specific aspects of these efforts are classified and will be provided on a need-to-know basis. Please contact USCYBERCOM, 443-634-7769</p> <p>FY 2019 Plans: Continue to evolve the Joint Cyber Warfighter Architecture (JCWA) to enable split-based offensive and defensive operations.</p> <p>Deploy CENTROPY for an initial set of use cases. CENTROPY is a Cyber C2 system that provides oversight and management of operational readiness.</p> <p>Continue to support delivery of the Unified Cyber Analysis Portal (UCAP) to a full operational capability (FOC) that provides a comprehensive solution for malware triage.</p> <p>Continue employment of USCYBERCOM cross domain solutions that enable automated data flow from access platform to data repository.</p> <p>Continue development of the Unclassified Amazon Web Services (AWS) GovCloud and Big Data Platform (BDP) that enables the Service CMF teams to identify anomalous behavior on the Department of Defense Information Network (DODIN) network.</p> | 73.800 | 52.962 | 36.389 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | | R-1 Program Element (Number/Name) PE 0306250F / <i>Cyber Operations Technology Development</i> | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| <p>Continue development of technologies, policies, and processes needed to enable Intelligence and "indicator" sharing across the DODIN tiers and domains.</p> <p>FY 2020 Plans: Will continue the development of the JCWA as the common joint capability to enable split-based, offensive and defensive operations.</p> <p>Will continue to develop and expand the malware analysis capabilities of the UCAP.</p> <p>Will continue development of USCYBERCOM cross-domain solutions that enable automated data flow from access platform to data repository and enable enrichment of data and reporting across security domains.</p> <p>Will continue development of the Amazon Web Services (AWS) GovCloud and Big Data Platform (BDP) across multiple security domains to enable the Service CMF teams to identify anomalous behavior on the DODIN network.</p> <p>Will continue development of technologies, policies, and processes needed to enable Intelligence and "indicator" sharing across the DODIN tiers and domains.</p> <p>Some aspects of the efforts are classified and will be provided on a need-to-know basis. For further information, please contact USCYBERCOM, 443-634-7769.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding decrease due to the reduction of the Missile Defeat and Defense Enhancement effort and realignment of JCC2 funding to AFLCMC as executive agent for the Cyber Command and Control Material System Enhancement.</p> | | | | |
| <p>Title: Joint Access Platforms</p> <p>Description: Funding supports capabilities used in Cyber Mission Force (CMF) operations to access targets and retrieve data.</p> <p>The origin, details, and specific aspects of these efforts are classified and will be provided on a need-to-know basis. Please contact USCYBERCOM,443-634-7769.</p> <p>FY 2019 Plans: Continue development and deployment of the on-net operations infrastructure used to conduct Title 10 cyberspace operations.</p> | | 52.568 | 84.249 | 68.679 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | | R-1 Program Element (Number/Name) PE 0306250F / <i>Cyber Operations Technology Development</i> | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| <p>Support continued development of capabilities to enable systems to provide client/server architecture to deliver multiple mission-based cyber effects.</p> <p>Continue development of operational system that delivers distributed denial of service (DDoS) capabilities on the DODIN.</p> <p>FY 2020 Plans: Will continue development and deployment of on-net operations infrastructure.</p> <p>Will continue to develop improvements for client/server platforms that delivers multiple mission-based cyber effects.</p> <p>Will continue development of operational system that delivers DDoS capabilities on the DODIN.</p> <p>Some aspects of the efforts are classified and will be provided on a need-to-know basis. For further information, please contact USCYBERCOM, 667-812-0814.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding decrease due to the reduction of the Missile Defeat and Defense Enhancement effort.</p> | | | | |
| <p>Title: Joint Tools</p> <p>Description: Funding supports capabilities used by the CMF to enable and conduct cyber operations against aligned targets.</p> <p>The origin, details, and specific aspects of these efforts are classified and will be provided on a need-to-know basis. Please contact USCYBERCOM, 443-634-7769.</p> <p>FY 2019 Plans: Continue development of exploits and the exploitation framework for USCYBERCOM.</p> <p>Continue the tool repository and signature management on each spiral of delivered tools that enables tool measurement and repository as well as a means to manipulate tool code to minimize risk of discovery.</p> <p>Continue to develop and deliver additional foundational tools suites and continue to populate existing tool suites with the full complement of required capabilities. The foundational tool suites will provide operational agility for CMF cyberspace operations.</p> <p>Continue spiral development process of cyberspace operations basic tools that provide operational agility during CMF effects operations.</p> | | 142.653 | 98.520 | 86.388 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | | R-1 Program Element (Number/Name) PE 0306250F / <i>Cyber Operations Technology Development</i> | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| <p>Continue to support development and employment of the results from the signature diversity study.</p> <p>Continue to support a classified research and development effort in support of combatant command requirements. All aspects of this effort are classified and will be provided on a need to know basis. This is a congressional special interest item.</p> <p>FY 2020 Plans: Will continue development of exploits and the exploitation frameworks.</p> <p>Will complete implementation of signature diversity capability which will have the effect of force multiplication. This capability will enable manipulation of tools code such that a single tool can look like multiple tools and provides a means to minimize risk of discovery.</p> <p>Will continue to develop and deliver additional foundational tools suites to incrementally achieve a full complement of required capabilities. The foundational tool suites will provide operational agility for CMF cyberspace operations.</p> <p>Will continue to grow the tool repository and measure signatures on each spiral of delivered tools to verify uniqueness of tools considered to be diverse.</p> <p>Will continue to develop and deliver specialized tools and exploits to CMF. Tools are designed to enable specific outcomes against adversary targets and technologies.</p> <p>Will continue to support a classified research and development effort in support of combatant command requirements. All aspects of this effort are classified and will be provided on a need to know basis. This is a congressional special interest item.</p> <p>Some aspects of the efforts are classified and will be provided on a need to know basis. For further information, please contact USCYBERCOM, 443-634-7769.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding decrease due to the reduction of the Missile Defeat and Defense Enhancement effort.</p> | | | | |
| <p>Title: Joint Analytics</p> <p>Description: Funding in Analytics supports capabilities used in CMF operations to correlate data collected from multiple sources to garner unique insight to enable decision making.</p> | | 9.500 | 10.771 | 7.408 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0306250F / <i>Cyber Operations Technology Development</i> |
|--|--|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| <p>The origin, details and specific aspects of these efforts are classified and will be provided on a need-to-know basis. Please contact USCYBERCOM, 443-634-7769.</p> <p>FY 2019 Plans: Support creation and development of Advanced Data Analytics that provide big data analysis tools and techniques, assist with developing target folders (to include target analysis, target system analysis, and network analysis), provide technical expertise on data query strategies, provide technical continuity for development efforts.</p> <p>FY 2020 Plans: Will continue development and sustainment of Advanced Frameworks and accompanying Data Analytics for cyber operations.</p> <p>Many aspects of the effort are classified and will be provided on a need-to-know basis. For further information, please contact USCYBERCOM at 443-634-7769.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding decrease due to the reduction of the Missile Defeat and Defense Enhancement effort.</p> | | | |
| Accomplishments/Planned Programs Subtotals | 278.521 | 246.502 | 198.864 |

D. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

E. Acquisition Strategy

Facilitate the delivery of technology capabilities to the Cyber Mission Forces, by applying innovative solutions for existing and emerging technologies. Contracts are awarded under full and open competition whenever possible. Variations of both Fixed Price (FP) and Cost Plus (CP) contracting vehicles and the use of Other Transactional Authority (OTA) will be implemented leveraging USCYBERCOM Acquisition authorities. USCYBERCOM will also rely on various Service Component, Combatant Command and National Security Agency contracting offices for procurement of cyber capabilities and contractor support.

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0306250F / <i>Cyber Operations Technology Development</i> | Project (Number/Name) 646008 / <i>US Cyber Command Technology Development</i> |
|--|--|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Joint Common Services | Various | Multiple Agencies : Various | - | 73.113 | Feb 2018 | 52.125 | Apr 2019 | 35.607 | Jan 2020 | - | | 35.607 | Continuing | Continuing | - |
| Joint Access Platforms | Various | Multiple Agencies : Various | - | 51.970 | Feb 2018 | 83.415 | Apr 2019 | 67.897 | Jan 2020 | - | | 67.897 | Continuing | Continuing | - |
| Joint Tools | Various | Multiple Agencies : Various | - | 142.029 | Feb 2018 | 97.686 | Apr 2019 | 85.606 | Jan 2020 | - | | 85.606 | Continuing | Continuing | - |
| Joint Analytics | Various | Multiple Agencies : Various | - | 8.870 | Feb 2018 | 9.940 | Apr 2019 | 6.629 | Jan 2020 | - | | 6.629 | Continuing | Continuing | - |
| Subtotal | | | - | 275.982 | | 243.166 | | 195.739 | | - | | 195.739 | Continuing | Continuing | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| PMA | Various | Various : Various | - | 2.539 | Feb 2018 | 3.336 | Apr 2019 | 3.125 | Jan 2020 | - | | 3.125 | Continuing | Continuing | - |
| Subtotal | | | - | 2.539 | | 3.336 | | 3.125 | | - | | 3.125 | Continuing | Continuing | N/A |

| | | | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|--|--|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|
| Project Cost Totals | | | - | 278.521 | 246.502 | 198.864 | - | 198.864 | Continuing | Continuing | N/A |

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0306250F / <i>Cyber Operations Technology Development</i> | Project (Number/Name) 646008 / <i>US Cyber Command Technology Development</i> |
|--|--|---|

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| <i>Cyber Operations Technology Development</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| 1. UP AoA (Joint Common Services, formerly Defend the Nation) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2. UP RR (Joint Common Services, formerly Defend the Nation) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3. Cyber C2 FOC (Joint Common Services) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4. Cyber C2 Spiral Development (Joint Common Services) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5. Cyber SA Prototype (Joint Common Services, formerly Defend the Nation) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6. Data analytics platform next GEN (Joint Common Services) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7. Cyber UCAP FOC (Joint Common Services, formerly Defend the Nation) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8. Cyber UCAP Spiral Development - 1 (Joint Common Services) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9. CYBERCOM access platform IOC (Joint Access Platforms, formerly Combatant Command Support and Operate and Defend the DODIN) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10. CYBERCOM access platform build out capacity (Joint Access Platforms, formerly Combatant Command Support and Operate and Defend the DODIN) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11. Cyber data flow cross domain solution (Joint Access Platforms, formerly Combatant Command Support and Operate and Defend the DODIN) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0306250F / <i>Cyber Operations Technology Development</i> | Project (Number/Name) 646008 / <i>US Cyber Command Technology Development</i> |
|--|--|---|

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| 12. Mission-based platform FOC (Joint Access Platforms, formerly Combatant Command Support and Operate and Defend the DODIN) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13. Data analytics platform IOC (Access Platforms, formerly Combatant Command Support and Operate and Defend the DODIN) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 14. DDoS for DODIN sustain (Joint Access Platforms, formerly Combatant Command Support and Operate and Defend the DODIN) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15. DDoS for DODIN spiral development (Joint Access Platforms) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16. Exploitation framework spiral development (annual) - (Joint Tools, formerly Combatant Command Support and Operate and Defend the DODIN) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 17. Foundational tool suites (spirals annual) - (Joint Tools, formerly Combatant Command Support and Operate and Defend the DODIN) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 18. Tool signature management study (Joint Tools, formerly Combatant Command and Support and Operate and Defend the DODIN) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 19. Analytics development (Joint Analytic, formerly Combatant Command Support and Operate and Defend the DODIN) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0306250F / <i>Cyber Operations Technology Development</i> | Project (Number/Name) 646008 / <i>US Cyber Command Technology Development</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|---|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Cyber Operations Technology Development</i> | | | | |
| 1. UP AoA (Joint Common Services, formerly Defend the Nation) | 1 | 2018 | 4 | 2018 |
| 2. UP RR (Joint Common Services, formerly Defend the Nation) | 1 | 2018 | 4 | 2018 |
| 3. Cyber C2 FOC (Joint Common Services) | 1 | 2018 | 4 | 2019 |
| 4. Cyber C2 Spiral Development (Joint Common Services) | 1 | 2020 | 4 | 2023 |
| 5. Cyber SA Prototype (Joint Common Services, formerly Defend the Nation) | 1 | 2018 | 4 | 2018 |
| 6. Data analytics platform next GEN (Joint Common Services) | 2 | 2018 | 2 | 2020 |
| 7. Cyber UCAP FOC (Joint Common Services, formerly Defend the Nation) | 1 | 2018 | 2 | 2018 |
| 8. Cyber UCAP Spiral Development - 1 (Joint Common Services) | 3 | 2019 | 1 | 2021 |
| 9. CYBERCOM access platform IOC (Joint Access Platforms, formerly Combatant Command Support and Operate and Defend the DODIN) | 1 | 2018 | 4 | 2019 |
| 10. CYBERCOM access platform build out capacity (Joint Access Platforms, formerly Combatant Command Support and Operate and Defend the DODIN) | 1 | 2018 | 4 | 2023 |
| 11. Cyber data flow cross domain solution (Joint Access Platforms, formerly Combatant Command Support and Operate and Defend the DODIN) | 1 | 2018 | 4 | 2019 |
| 12. Mission-based platform FOC (Joint Access Platforms, formerly Combatant Command Support and Operate and Defend the DODIN) | 1 | 2018 | 3 | 2022 |
| 13. Data analytics platform IOC (Access Platforms, formerly Combatant Command Support and Operate and Defend the DODIN) | 1 | 2018 | 4 | 2018 |
| 14. DDoS for DODIN sustain (Joint Access Platforms, formerly Combatant Command Support and Operate and Defend the DODIN) | 1 | 2018 | 4 | 2019 |
| 15. DDoS for DODIN spiral development (Joint Access Platforms) | 1 | 2018 | 3 | 2023 |
| 16. Exploitation framework spiral development (annual) - (Joint Tools, formerly Combatant Command Support and Operate and Defend the DODIN) | 1 | 2018 | 4 | 2023 |

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0306250F / <i>Cyber Operations Technology Development</i> | Project (Number/Name) 646008 / <i>US Cyber Command Technology Development</i> |
|--|--|---|

| Events by Sub Project | Start | | End | |
|--|----------------|-------------|----------------|-------------|
| | Quarter | Year | Quarter | Year |
| 17. Foundational tool suites (spirals annual) - (Joint Tools, formerly Combatant Command Support and Operate and Defend the DODIN) | 1 | 2018 | 4 | 2023 |
| 18. Tool signature management study (Joint Tools, formerly Combatant Command and Support and Operate and Defend the DODIN) | 1 | 2018 | 4 | 2018 |
| 19. Analytics development (Joint Analytic, formerly Combatant Command Support and Operate and Defend the DODIN) | 1 | 2018 | 4 | 2023 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0306415F / <i>Enabled Cyber Activities</i> |
|--|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|--|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 16.687 | 16.325 | 16.632 | 0.000 | 16.632 | 16.917 | 17.268 | 17.582 | 17.898 | Continuing | Continuing |
| 646008: <i>US Cyber Command Technology Development</i> | - | 16.687 | 16.325 | 16.632 | 0.000 | 16.632 | 16.917 | 17.268 | 17.582 | 17.898 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

US Cyber Command's (USCYBERCOM) mission is to deter or defeat strategic threats to US interests and infrastructure, provide mission assurance for the operations and defense of the Department of Defense information environment, and support the achievement of joint force commander objectives.

USCYBERCOM develops or procures capabilities to enable Electronic Warfare and cyber-peculiar technologies for use by the Cyber Mission Forces (CMF).

The specific details and aspects of these cyber activities are classified and will be provided on a need-to-know basis. Please contact USCYBERCOM at 443-634-7769.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 16.687 | 16.325 | 16.632 | 0.000 | 16.632 |
| Current President's Budget | 16.687 | 16.325 | 16.632 | 0.000 | 16.632 |
| Total Adjustments | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0306415F / <i>Enabled Cyber Activities</i> |
|--|---|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| <p>Title: Cyber Technology Development</p> <p>Description: Demonstrate, develop, and evaluate prototype electronic warfare (EW) and cyber capabilities.</p> <p>The origin, details and specific aspects of these efforts are classified.</p> <p>FY 2019 Plans: Continuing to adapt EW technology to facilitate the development and delivery of Electronic Warfare (EW) and cyber-peculiar capabilities.</p> <p>The origin, details, and specific aspects of these efforts are classified and will be provided on a need-to-know basis. For further information please contact USCYBERCOM at 443-634-7769.</p> <p>FY 2020 Plans: Will continue to adapt EW technology and cyber-peculiar capabilities to gain access to targeted enemy forces.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding increase due to FY20 inflation growth.</p> <p>Many aspects of the effort are classified and will be provided on a need-to-know basis. For further information please contact USCYBERCOM at 443-634-7769.</p> | 16.687 | 16.325 | 16.632 |
| Accomplishments/Planned Programs Subtotals | 16.687 | 16.325 | 16.632 |

D. Other Program Funding Summary (\$ in Millions)
N/A

Remarks

E. Acquisition Strategy
Facilitate the delivery of new Electronic Warfare (EW) cyber capability, by applying innovative solutions for existing and emerging technologies. Contracts are awarded under full and open competition whenever possible. Variations of both Fixed Price (FP) and Cost Plus (CP) contracting vehicles will be executed and managed by USCYBERCOM Acquisition authority, as well as various Service Component contracting offices, other Defense Agency contracting offices and the National Security Agency contracting offices.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0306415F / <i>Enabled Cyber Activities</i> |
|--|---|

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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| Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0306415F / Enabled Cyber Activities | Project (Number/Name) 646008 / US Cyber Command Technology Development |
|--|--|--|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | | | |
|--------------------------------------|------------------------|--------------------------------|-------------|---------|------------|---------|--------------|--------------|-------------|-------------|---------------|------------------|------------------|--------------------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | Target Value of Contract |
| Cyber Technology Development | Various | Multiple Agencies : Various | - | 16.687 | Mar 2018 | 16.325 | May 2019 | 16.632 | Jan 2020 | - | | 16.632 | Continuing | Continuing | - |
| Subtotal | | | - | 16.687 | | 16.325 | | 16.632 | | - | | 16.632 | Continuing | Continuing | N/A |
| | | | Prior Years | FY 2018 | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract | |
| Project Cost Totals | | | - | 16.687 | 16.325 | | 16.632 | | - | | 16.632 | Continuing | Continuing | N/A | |

Remarks

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0306415F / <i>Enabled Cyber Activities</i> | Project (Number/Name) 646008 / <i>US Cyber Command Technology Development</i> |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|--|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
|--|------------|
| <i>Electronic Warfare (EW) Capabilities</i> | |
| EW Capability Spiral (annual) | [REDACTED] |
| SATCOM Capability Spiral (annual) | [REDACTED] |
| Communications Capabiliy Spiral (annual) | [REDACTED] |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0306415F / <i>Enabled Cyber Activities</i> | Project (Number/Name) 646008 / <i>US Cyber Command Technology Development</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Electronic Warfare (EW) Capabilities</i> | | | | |
| EW Capability Spiral (annual) | 1 | 2018 | 4 | 2023 |
| SATCOM Capability Spiral (annual) | 1 | 2018 | 4 | 2023 |
| Communications Capabiliy Spiral (annual) | 1 | 2018 | 4 | 2023 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force / BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0408011F / <i>Special Tactics / Combat Control</i> |
|--|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|--|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 4.266 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| 646221: <i>Ground-based Counter-IADS (C-IADS) Capability</i> | - | 4.266 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

Note
In FY 2019 Project 646221, A2AD (Anti-access and area denial) Threat Defeat was terminated

A. Mission Description and Budget Item Justification

Develop and field capabilities used to identify, develop, modify, demonstrate, and integrate technical solutions that utilize coordinated effects in the avoidance and defeat of modern threat systems. Research existing and projected threats to systems as well as self-protection strategies and technologies, to develop counter-threat systems that deliver coordinated effects against threat systems.

In 2018 A2AD (Anti-access and area denial) Threat Defeat was a new start.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver nuclear weapon support capabilities. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, 0605898F, and 0605833F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force / BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0408011F / <i>Special Tactics / Combat Control</i> |
|--|---|

| B. Program Change Summary (\$ in Millions) | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020 Base</u> | <u>FY 2020 OCO</u> | <u>FY 2020 Total</u> |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 4.500 | 0.000 | 0.000 | 0.000 | 0.000 |
| Current President's Budget | 4.266 | 0.000 | 0.000 | 0.000 | 0.000 |
| Total Adjustments | -0.234 | 0.000 | 0.000 | 0.000 | 0.000 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | -0.234 | 0.000 | 0.000 | 0.000 | 0.000 |

| C. Accomplishments/Planned Programs (\$ in Millions) | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> |
|--|----------------|----------------|----------------|
| Title: A2AD (Anti-access and area denial) Threat Defeat | 4.266 | 0.000 | 0.000 |
| Description: Develop and field capabilities used to in identify, develop, modify, demonstrate, and integrate technical solutions that utilize coordinated effects in the avoidance and defeat of modern threat systems. Research existing and projected threats to systems as well as self-protection strategies and technologies, to develop counter-threat systems that deliver coordinated effects against threat systems. | | | |
| FY 2019 Plans: N/A | | | |
| N/A | | | |
| FY 2020 Plans: N/A | | | |
| Accomplishments/Planned Programs Subtotals | 4.266 | 0.000 | 0.000 |

| D. Other Program Funding Summary (\$ in Millions) | | | | | | | | | | | |
|--|----------------|----------------|---------------------|--------------------|----------------------|----------------|----------------|----------------|----------------|-------------------------|-------------------|
| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020 Base</u> | <u>FY 2020 OCO</u> | <u>FY 2020 Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To Complete</u> | <u>Total Cost</u> |
| • OPAF 03 Line item 837100: <i>Tactical C-E Equipment</i> | 15.524 | 61.389 | 52.094 | - | 52.094 | 44.269 | 66.330 | 19.315 | 25.664 | Continuing | Continuing |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force / BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0408011F / <i>Special Tactics / Combat Control</i> |
|--|---|

D. Other Program Funding Summary (\$ in Millions)

| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> <u>Base</u> | <u>FY 2020</u> <u>OCO</u> | <u>FY 2020</u> <u>Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To</u> <u>Complete</u> | <u>Total Cost</u> |
|------------------|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|
|------------------|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|

Remarks

E. Acquisition Strategy

BAO Kit is executing initial prototype research and development for this effort. Development will include system engineering, design, integration and fielding for C-IADS and Indefinite Quantity system upgrades. Wright Patterson AFB, OH manages the contract effort

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|---|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0408011F / <i>Special Tactics / Combat Control</i> | Project (Number/Name) 646221 / <i>Ground-based Counter-IADS (C-IADS) Capability</i> |
|--|---|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | | | |
|--------------------------------------|------------------------|--------------------------------|-------------|---------|------------|---------|--------------|--------------|-------------|-------------|---------------|------------------|------------------|--------------------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | Target Value of Contract |
| A2AD Threat Defeat | TBD | Various : TBD | - | 4.266 | | - | | - | | - | | - | Continuing | Continuing | - |
| Subtotal | | | - | 4.266 | | - | | - | | - | | - | Continuing | Continuing | N/A |
| | | | Prior Years | FY 2018 | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract | |
| Project Cost Totals | | | - | 4.266 | 0.000 | | - | | - | | - | Continuing | Continuing | N/A | |

Remarks

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0408011F / <i>Special Tactics / Combat Control</i> | Project (Number/Name) 646221 / <i>Ground-based Counter-IADS (C-IADS) Capability</i> |

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| N/A | [REDACTED] | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0408011F / <i>Special Tactics / Combat Control</i> | Project (Number/Name) 646221 / <i>Ground-based Counter-IADS (C-IADS) Capability</i> |

Schedule Details

| Events | Start | | End | |
|--------|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| N/A | 1 | 2018 | 4 | 2018 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|--|--|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0901410F / <i>Contracting Information Technology System</i> |
|--|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 18.973 | 17.577 | 20.830 | 0.000 | 20.830 | 5.672 | 17.485 | 8.274 | 8.423 | Continuing | Continuing |
| 643483: <i>CON-IT</i> | - | 18.973 | 17.577 | 20.830 | 0.000 | 20.830 | 5.672 | 17.485 | 8.274 | 8.423 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

Contracting Information Technology System (CON-IT) provides a single contract management system for the Air Force contracting community to support all contracting needs including base operations, logistics, contingency, research, and weapons system contracting world-wide. CON-IT will enable strategic sourcing and other acquisition efficiencies by standardizing data, business rules, and milestone tracking. Furthermore, CON-IT will allow for a standardized and integrated method of anticipating, reacting, and responding to the current pace and changes in process, regulation, and technology across the contract domain. CON-IT is the replacement for the AF's version of Standard Procurement System (SPS). When fully implemented, CON-IT will enable business process changes necessary to converge on a common contract writing/management capability within the Air Force.

CON-IT capabilities will be developed in accordance with the agile software development methodology. The CON-IT Integrated Program Office (IPO) will configure upon the Defense Information Systems Agency's (DISA's) government off-the-shelf (GOTS) product called Integrated Defense Enterprise Acquisition System (IDEAS) contract writing system, which provided a solution that serves as a baseline for CON-IT. CON-IT will utilize a non-traditional acquisition approach by leveraging DISA IDEAS as well as partnering with the United States Department of Agriculture's (USDA) Enterprise Application Services (EAS) team via an inter-agency agreement to develop, test, validate, train end users, deploy, and maintain CON-IT. USDA's National Information Technology Center (NITC) will provide and maintain the DevSecOps and production environments.

Gap requirements will be addressed through an iterative process of sprint development cycles, where usable capability is produced and made available to operational users after every sprint. The IPO construct along with application of agile principles allows the program to properly plan system requirements, deliver early capability to the end users, achieve early return on investment of taxpayer dollars, division of risk, reduce waste, effectively respond to change, and continuously improve our processes.

Through agile software development CON-IT will address the current inefficiencies in the contracting domain, given there are multiple contract writing systems that continue to challenge the ability to operate responsively, consistently, and cost-effectively to award, administer, and close out mission critical contracts in a timely fashion. CON-IT will allow the contracting community to fully support compliance with financial auditability and Financial Improvement Audit Readiness (FIAR) goals that depend on the integrity of the data flow through the Procure to Pay (P2P) process.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver CON-IT capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, and 0605898F.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|--|--|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0901410F / <i>Contracting Information Technology System</i> |
|--|--|

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 15.867 | 17.577 | 20.830 | 0.000 | 20.830 |
| Current President's Budget | 18.973 | 17.577 | 20.830 | 0.000 | 20.830 |
| Total Adjustments | 3.106 | 0.000 | 0.000 | 0.000 | 0.000 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 3.106 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Change Summary Explanation

FY18 \$3.1M increase due to below threshold reprogramming approved Jun 2018.

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Title: CON-IT System Development | 18.973 | 17.577 | 20.830 | 0.000 | 20.830 |
| Description: Initiated in FY17 CON-IT's agile development execution is resulting in delivery of contracting capability to operational contracting officers (COs). CON-IT system capabilities continue to be developed and enhanced through completion of development sprint cycles in accordance with our agile software development strategy. The CON-IT Integrated Program Office (IPO) has established early user engagement through a series of subject matter expert familiarization events, in which system capabilities produced from each sprint cycle are tested by operational COs and valuable user feedback is collected and incorporated into our requirements backlog. Early Operational Capability (EOC) was achieved in FY18 with initial deployment of current CON-IT capabilities to 12AF (AFSOUTH) and subsequent EOC deployment to 8 additional operational locations across | | | | | |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0901410F / <i>Contracting Information Technology System</i> |
|--|--|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|--|---------|---------|--------------|-------------|---------------|
| <p>the Air Force in every MAJCOM, except US Air Forces Europe. In addition, the CON-IT IPO will integrate the contracting workforce schoolhouses into our training activities; provide initial training to the instructors; and set the training curriculum for new Air Force CO accessions. The completion of the 8 early deployments and training curriculum greatly aids in our risk reduction and organizational change management efforts. Future system development continues to be planned through an iterative process of sprint/release planning and backlog grooming activities between our stakeholder partners which ensures that the capabilities developed meet our end users' needs and increase mission success.</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none"> - Deploy to remaining 96 active duty locations and shutdown Air Force SPS at those sites - Continue development sprints and deployment of remaining Operational Contracting backlog requirements - Complete Government Furnished Equipment (GFE) requirements and development of automated test plans to evaluate system change impacts - Continue IT infrastructure services, help desk/customer support, and training curriculum - Continue CON-IT acquisition planning, reporting, and execution activities for future capabilities - Plan and conduct familiarization events of future CON-IT capabilities - Update inter-agency agreement with US Department of Agriculture <p>FY 2020 Base Plans:</p> <ul style="list-style-type: none"> - Will update inter-agency agreement with US Department of Agriculture - Will continue development and deployment activities of R&D, Weapon System and Logistics capabilities - Will continue development of automated test plans to evaluate system change impacts prior to fielding <p>FY 2020 OCO Plans:</p> <p>Not applicable - CON-IT has no OCO funding</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p> <p>Funding increase due to increasing development velocity and program resources to complete Operational Contracting backlog and begins weapons/R&D/logistics solution development</p> | | | | | |
| Accomplishments/Planned Programs Subtotals | 18.973 | 17.577 | 20.830 | 0.000 | 20.830 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 0901410F / <i>Contracting Information Technology System</i> |
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D. Other Program Funding Summary (\$ in Millions)

| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> | <u>FY 2020</u> | <u>FY 2020</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To</u> | <u>Total Cost</u> |
|---|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-----------------|-------------------|
| | | | <u>Base</u> | <u>OCO</u> | <u>Total</u> | | | | | <u>Complete</u> | |
| • OPAF 03 Line Item #834010: <i>General Information Technology</i> | - | 5.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | - | Continuing | Continuing |

Remarks

Other Procurement Air Force (OPAF) funding is for the purchase of software licenses required for the CON-IT System. In FY17, CON-IT OPAF (\$5.9M) was a new start. New Start notification letters were sent to all four committees on 12 Sep 17 with intent to purchase end user licenses for the system.

E. Acquisition Strategy

CON-IT will be developed using an incremental approach following the Business Capability Acquisition Cycle (BCAC). Increments of major functional capability are decomposed further into epic/story elements and delivered to the user when the capability has been accepted, training curriculums have been updated, and the infrastructure is ready. Program management office, functional user, and system integrator are trained and functioning as a cohesive, high-performing team. An interagency agreement with US Department of Agriculture (USDA) for risk reduction, prototyping and development activities has been signed and is currently in effect. This agreement requires annual renewal.

CON-IT is not only a contract writing solution but a contract management system for the enterprise business process. This is accomplished by transitioning to a Business Process Management platform that, once implemented, will allow the enterprise to easily adapt to change by automating contracting phases to the maximum extent possible. The end state for CON-IT will replace 4 legacy contract writing systems and 6 supporting systems when all increments are fielded.

The CON-IT roadmap includes five major capabilities. Capability 1 modernizes contract writing for base-level and operational users, allowing the AF's Standard Procurement System version and AFCENTs' O'ContraX to sunset as sites transition to CON-IT. AF Contracting community is focused on replacing AF's SPS before the cybersecurity certifications expire in CY19. Capability 2 deploys the same capability to the acquisition, research, and logistics communities, meeting their unique needs. This capability will result with sunsetting ConWrite and ACPS. Capability 3 and 4 automate pre/post award activities for the unclassified user base from Capability 1 and 2. Capability 5 implements all the previous capabilities for classified users.

CON-IT is aligned to OSD DPAP's strategy for procurement systems. The program is re-engineering and automating the entire business process, implementing data standards across the community (set by OSD), consolidating 10 legacy systems down to 1, reusing GOTS solutions versus creating a new solution, and employing agile software development methods (a best practice from industry).

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0901410F / <i>Contracting Information Technology System</i> | Project (Number/Name) 643483 / <i>CON-IT</i> |
|--|--|--|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|--|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| CON IT: Prime Developer/ Systems Integrator | MIPR | Contracting Information : Wright Patterson AFB, OH | - | 10.500 | Oct 2017 | 13.070 | Oct 2018 | 15.487 | Oct 2019 | - | | 15.487 | Continuing | Continuing | - |
| Subtotal | | | - | 10.500 | | 13.070 | | 15.487 | | - | | 15.487 | Continuing | Continuing | N/A |

Remarks
Interagency agreement with USDA (United States Department of Agriculture)

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| CON IT: Test and staging environment from USDA | MIPR | Various : Various | - | 3.691 | Oct 2017 | 0.692 | Oct 2018 | 0.922 | Oct 2019 | - | | 0.922 | Continuing | Continuing | - |
| Subtotal | | | - | 3.691 | | 0.692 | | 0.922 | | - | | 0.922 | Continuing | Continuing | N/A |

Remarks
USDA: United States Department of Agriculture

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| CON IT: Program Management Administration | C/CPAF | AFLCMC/HI : Wright Patterson AFB, OH | - | 0.934 | Oct 2017 | 0.000 | Oct 2018 | 0.000 | Oct 2019 | - | | 0.000 | Continuing | Continuing | - |
| CON IT: Program Management Administration, Cost Estimating Support, Travel, Supplies, Equipment, Program Office Network | Various | AFLCMC/HIBB : WPAFB, OH | - | 3.848 | Oct 2017 | 3.815 | Oct 2018 | 4.421 | Oct 2019 | - | | 4.421 | Continuing | Continuing | - |

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0901410F / <i>Contracting Information Technology System</i> | Project (Number/Name) 643483 / <i>CON-IT</i> |
|--|--|--|

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Support, Engineering Services, etc. | | | | | | | | | | | | | | | |
| Subtotal | | | - | 4.782 | | 3.815 | | 4.421 | | - | | 4.421 | Continuing | Continuing | N/A |

Remarks
A&AS: Advisory & Assistance Services
Multiple contract awards for less than \$1M per award

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|
| Project Cost Totals | - | 18.973 | 17.577 | 20.830 | - | 20.830 | Continuing | Continuing | N/A |

Remarks

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0901410F / <i>Contracting Information Technology System</i> | Project (Number/Name) 643483 / <i>CON-IT</i> |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|--|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| <i>CON-IT Incremental Development Activities</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Agile Software Development of AF Contracting Domain Mission Set | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Development, Test & Deployment Operational Contracting Capability | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Development, Test & Deployment of Weapon Sys/R&D/Log/Business Intel Capability | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Development, Test & Deployment of Pre-Award Contracting Capability | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Development, Test & Deployment of Post Award Contracting Capability | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Development, Test & Deployment of All Prior Capability to Classified Users | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 0901410F / <i>Contracting Information Technology System</i> | Project (Number/Name) 643483 / <i>CON-IT</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| CON-IT Incremental Development Activities | | | | |
| Agile Software Development of AF Contracting Domain Mission Set | 1 | 2018 | 4 | 2024 |
| Development, Test & Deployment Operational Contracting Capability | 1 | 2018 | 4 | 2019 |
| Development, Test & Deployment of Weapon Sys/R&D/Log/Business Intel Capability | 1 | 2020 | 4 | 2022 |
| Development, Test & Deployment of Pre-Award Contracting Capability | 1 | 2023 | 4 | 2023 |
| Development, Test & Deployment of Post Award Contracting Capability | 1 | 2024 | 4 | 2024 |
| Development, Test & Deployment of All Prior Capability to Classified Users | 4 | 2024 | 4 | 2024 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P) | R-1 Program Element (Number/Name) PE 1203164F I NAVSTAR Global Positioning System (User Equipment) (SPACE) |
|---|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | 722.985 | 321.186 | 252.834 | 329.948 | 0.000 | 329.948 | 160.139 | 47.178 | 71.686 | 116.771 | 543.700 | 2,566.427 |
| 643833: MILITARY GLOBAL POSITIONING SYSTEM USER EQUIP | 722.985 | 321.186 | 252.834 | 329.948 | 0.000 | 329.948 | 160.139 | 47.178 | 71.686 | 116.771 | 543.700 | 2,566.427 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | - | - |

Program MDAP/MAIS Code: 447

Note

Prior Year Joint Service System Management Office (JSSMO) funding was removed from Prior Years Cost Exhibit and from R3.

A. Mission Description and Budget Item Justification

The Global Positioning System (GPS) is a space-based radio Positioning, Navigation, and Timing (PNT) distribution system. GPS User Equipment (UE) consists of standardized receivers, antennas, antenna electronics, and other related equipment, grouped together in sets to derive navigation and time information transmitted from GPS satellites. These receiver sets are used by the Department of Defense (DoD). Research, Development, Test and Evaluation (RDT&E) funds UE development, integration, test, and analysis for new PNT receiver capabilities in Navigation Warfare (NAVWAR) across all military platforms using GPS services.

The Military Global Positioning System User Equipment (MGUE) Increment (Inc) 1 program is responsible for the development of standard modernized receiver form factors for the Service-nominated lead platforms. The MGUE Inc 1 Capability Development Document (CDD) was approved by the Joint Requirements Oversight Council (JROC) on 24 July 2014. MGUE Inc 1 is initiating a new family of modernized GPS receivers that will deliver significantly improved capability to counter current and emerging PNT threats and enable military operations in a NAVWAR environment where current legacy receiver performance would be compromised. MGUE Inc 1 received a Milestone A decision in April 2012. The program received direction in February 2014 from the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L)) to execute a new acquisition strategy, accelerating the program to provide test units faster to facilitate military end users. The MGUE program received a Milestone B decision in January 2017.

The MGUE Inc 2 effort will continue to expand Military-Code (M-Code) receiver technology into additional applications (space receivers and precision guided munitions), and develop a modernized Handheld device to meet Service requirements. This effort leverages the MGUE Inc 1 technology to the maximum extent while addressing the production of M-Code integrated circuits far into the future. The JROC approved the MGUE Inc 2 CDD on 6 April 2018. The Air Force Service Acquisition Executive approved the MGUE Inc 2 Acquisition Strategy to include designation of two FY 2016 National Defense Authorization Act (NDAA) Section 804, Middle Tier Acquisition Rapid Prototype efforts: 1) Miniature Serial Interface (MSI) Receiver Cards to include next generation Application Specific Integrated Circuit (ASIC) and 2) Joint, Modernized Handheld Receiver.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity | R-1 Program Element (Number/Name) |
| 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | PE 1203164F / NAVSTAR Global Positioning System (User Equipment) (SPACE) |

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) is transforming the organization and implementation of space acquisition to an enterprise approach, maximizing innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose capabilities.

This Program Element (PE) may include necessary civilian pay expenses required to manage, execute, and deliver MGUE weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in PEs 1206392F and 1206398F.

Re-Phasing of GPS IIIF Buy Across FYDP saved \$34.800M in FY 2020. Re-Phasing of GPS IIIF Buy Across FYDP description: to align all GPS efforts across the enterprise in FY 2020, the Air Force realigned \$34.800M from Military Global Positioning System User Equipment Increment 1 to better synchronize the user segment with the current planned GPS launch schedule. All GPS program adjustments will fund higher priority space initiatives to improve lethality.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 253.939 | 286.629 | 240.748 | 0.000 | 240.748 |
| Current President's Budget | 321.186 | 252.834 | 329.948 | 0.000 | 329.948 |
| Total Adjustments | 67.247 | -33.795 | 89.200 | 0.000 | 89.200 |
| • Congressional General Reductions | 0.000 | -3.795 | | | |
| • Congressional Directed Reductions | -10.000 | -30.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 98.500 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | -9.346 | 0.000 | | | |
| • SBIR/STTR Transfer | -11.907 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 89.200 | 0.000 | 89.200 |

Change Summary Explanation

FY 2018: -\$10.000M Congressional decrease - funds early to Need MGUE Inc 1; +\$98.500M Congressional increase to Fund MGUE Inc 2; -\$9.346M for higher Air Force Space priorities.

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 1203164F / NAVSTAR Global Positioning System (User Equipment) (SPACE) |
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FY 2019: -\$30.000M Congressional reduction to improve funds management

FY 2020: +\$89.200M to fund MGUE Inc 1 to the Independent Cost Estimate (ICE) and Inc 2 to the Single Best Estimate (SBE)

| | | | |
|---|----------------|----------------|----------------|
| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|

| | | | |
|--|---------|--------|--------|
| <p>Title: MGUE Inc 1</p> <p>Description: The MGUE Inc 1 program develops standard modernized receiver form factors for the Service-nominated lead platforms in accordance with the MGUE Inc 1 CDD.</p> <p>FY 2019 Plans: Continue development, qualification testing and technical requirements verification. Complete initial security certification efforts. Continue to assist each lead platform office to integrate and test M-Code receivers in their respective platforms. Continue M-Code ASIC producibility analysis, risk reduction and early engineering, and perform engineering for Regional Military Protection (RMP) capabilities. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Continue activities that address MGUE ASIC obsolescence issues. Activities may include, but are not limited to, program office support, studies, technical analysis, prototyping, etc.</p> <p>FY 2020 Plans: Complete the following: Verification Testing, Qualification Testing, Technical Requirements Verification, Lead Platform Integration, and Card level Program Executive Officer Certification for Operational Test and Evaluation (OT&E). Continue to assist each lead platform office in integrating and testing M-Code receivers in their respective platforms. Continue M-Code ASIC producibility analysis, risk reduction, and early engineering. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Continue activities that address MGUE ASIC obsolescence issues. Activities may include, but are not limited to, program office support, studies, technical analysis, prototyping, etc.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 decreased compared to FY 2019 by \$44.510M. Justification for this decrease is described in plans above.</p> | 118.790 | 98.016 | 53.506 |
|--|---------|--------|--------|

| | | | |
|--|---------|--------|---------|
| <p>Title: MGUE Inc 2</p> <p>Description: The MGUE Inc 2 effort began in FY 2017 and will continue to develop M-Code receiver technology for additional applications (space receivers, precision guided munitions, and handheld receivers) to meet Service requirements. This effort leverages the MGUE Inc 1 technology to the maximum extent while ensuring producibility of M-Code integrated circuits far into the future to support DoD PNT requirements.</p> <p>FY 2019 Plans:</p> | 111.630 | 59.153 | 187.355 |
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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | | R-1 Program Element (Number/Name) PE 1203164F / NAVSTAR Global Positioning System (User Equipment) (SPACE) | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| <p>Continue evaluation of next generation ASIC and receiver design, engineering, architecture, requirements and functional reviews with vendors. Award contracts for next generation ASIC preliminary design and formal reviews. Core ASIC technology, including but not limited to, ASIC components, tools, design libraries and building blocks will be identified and/or purchased. Characterization for military purposes (e.g. temperatures and environments) will be performed. Next generation ASIC design and prototyping activities will occur at the new foundry. Continue security certification planning activities. Continue contract documentation preparation and solicitation for development of a new low size/power receiver to include integration with the next generation ASICs. Award contracts for M-Code Handheld risk reduction efforts. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, market research, studies, technical analysis, prototyping, etc.</p> <p>FY 2020 Plans: Continue development of next generation ASIC and receivers, complete Preliminary Design Review (PDR), and purchase any remaining core ASIC technology and ASIC design/manufacturing/test support. Commence security certification evaluations and refine plans. Award development contract(s) for new low size/power receiver to include next generation ASIC post-PDR and integration activities. Continue M-Code Handheld risk reduction activities, to include prototype evaluations. Secure any remaining core ASIC technology and begin early ASIC fabrication and manufacturing activities. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 increased compared to FY 2019 by \$128.202M. Justification for this increase is described in plans above.</p> | | | | |
| <p>Title: Advanced Technology</p> <p>Description: Advanced Technology includes efforts to mature technology for future GPS receivers called out in the MGUE CDDs. These efforts aim to find innovative solutions to increase resiliency in GPS performance and improve on size, weight, power, and cost (SWAP/C) of military receivers.</p> <p>FY 2019 Plans: Continue developing new technologies to augment United States (U.S.) military GPS receiver development. Deliver initial M-Code Government owned Intellectual Property (IP) for integration into both software defined radio (SDR) and ASIC implementations. Continue developing receiver capability to increase trust and integrity that might permit military use of other Global Navigation Satellite System (GNSS) signals for delivering assured PNT. Complete technical requirements documents (TRD) that define advanced antennas and antenna electronics, as well as integrated antenna electronics (AE) and receivers for size, weight, and power (SWAP) constrained platforms, which protects multi-GNSS solutions in a future NAVWAR environment. Continue</p> | | 13.041 | 8.500 | 5.097 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P) | | R-1 Program Element (Number/Name) PE 1203164F I NAVSTAR Global Positioning System (User Equipment) (SPACE) | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| assessment and development of advanced techniques and systems for jammer and spoofer identification and location across the GNSS bands to enhance situational awareness in a NAVWAR environment. FY 2020 Plans: Continue developing new technologies to augment U.S. Military GPS receiver development. Deliver first formal release of the M-Code Government owned IP for incorporation into vendor solutions, opening the M-Code market to additional participants, including simulator developers and small businesses. Develop test plans and procedures, perform testing and deliver reports on the incorporation of advanced trust / integrity algorithms that might permit military use of other GNSS signals for delivering assured PNT. Start the prototype development of an integrated antenna, AE and MGUE receiver suitable for protecting SWAP constrained platforms in a future NAVWAR environment. Identify and assess algorithms and hardware implementations for integration of enhanced anti-jam capability for SWAP constrained MGUE handheld receiver. FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 decreased compared to FY 2019 by \$3.403M. Justification for this decrease is described in plans above. | | | | |
| Title: System/Platform Integration and Performance Certification Description: Integration of MGUE Inc 1 receiver form factors into the Service-nominated lead platforms in support of developmental and operational test events. Conduct technical and operational modernization impact analysis for MGUE Service lead platform integration. FY 2019 Plans: Complete system level integration on ground-based Lead Platform efforts in support of developmental test. Continue Host Application Assembly (HAE) and system level integration for the air/maritime based Lead Platform efforts in support of developmental test. Continue lead platform integration efforts in support of operational test events. Assist DoD integration of M-Code GPS receivers for joint Service non-lead platforms. FY 2020 Plans: Complete developmental test of the Ground-based lead platform efforts. Complete HAE and system level integration for the air/maritime based Lead Platform efforts in support of developmental test. Continue lead platform integration efforts in support of operational test events. Assist DoD integration of M-Code GPS receivers for joint Service non-lead platforms. FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 decreased compared to FY 2019 by \$7.319M. Justification for this decrease is described in plans above. | | 67.486 | 78.115 | 70.796 |
| Title: Information Assurance, Security/Compatibility Certification, and Test/Evaluation Description: Develop, implement, and maintain GPS security certification programs. Development of DoD Policy, Strategy & Resource Requirements for MGUE security certification and compatibility certification. Security certification, compatibility | | 10.239 | 9.050 | 13.194 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P) | R-1 Program Element (Number/Name) PE 1203164F I NAVSTAR Global Positioning System (User Equipment) (SPACE) |
|---|--|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| certification, and security approval ensures future military GPS receivers protect critical program information and continue working in all environments and concepts of operations called for by U.S. Strategic Command. | | | |
| FY 2019 Plans: Complete initial security certification efforts for MGUE receivers. Support lead platform integration and test activities. Continue Modernized Security Evaluations/Tests for Selective Availability Anti-Spoofing Module (SAASM) and other legacy GPS receiver equipment. Review, approve, and track SAASM, M-Code receivers, and legacy receiver certified platforms and integrated applications for all of DoD. | | | |
| For the Ground Based-GPS Receiver Application Module-Military Code (GB-GRAM-M), complete the Technical Requirements Verification (TRV) for vendor A. Continue Phase 2 (Requirements Verification) and Phase 3 (Reliability) test activities for all vendors to include approved engineering changes. Continue Phase 4 (Lead Platform Integration) test activities for two of the GB-GRAM-M MGUE vendors. Accomplish Developmental Field LiveSky testing at White Sands Missile Range in an Electronic Warfare Environment. | | | |
| FY 2020 Plans: Continue to conduct security certification activities for all M-Code receivers, as required. Continue Modernized Security Evaluations/Tests for SAASM and other legacy GPS receiver equipment. Review, approve, and track SAASM, M-Code receivers, and legacy receiver certified platforms and integrated applications for all of DoD. Continue to conduct delta certifications, as required. For the GB-GRAM-M complete the Technical Requirements Verification. Continue Requirements Verification and Reliability test activities as required to include approved engineering changes. Continue Lead Platform Integration test activities for the GB-GRAM-M MGUE vendors. | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 increased compared to FY 2019 by \$4.144M. Justification for this increase is described in plans above. | | | |
| Accomplishments/Planned Programs Subtotals | 321.186 | 252.834 | 329.948 |

| D. Other Program Funding Summary (\$ in Millions) | | | | | | | | | | | |
|--|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-----------------|-------------------|
| Line Item | FY 2018 | FY 2019 | FY 2020 | FY 2020 | FY 2020 | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To | Total Cost |
| | | | Base | OCO | Total | | | | | Complete | |
| • SPAF 01 GPSSPC: Navstar GPS Space | 2.159 | 2.181 | 0.000 | - | 0.000 | 2.259 | 2.305 | 2.349 | 2.408 | 0.000 | 13.661 |

Remarks
Space Procurement, Air Force (SPAF) funding in this PE supports legacy SAASM efforts. Similar work for the MGUE is in the planning phase.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force Date: February 2019

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| Appropriation/Budget Activity 3600: Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P) | R-1 Program Element (Number/Name) PE 1203164F I NAVSTAR Global Positioning System (User Equipment) (SPACE) |
|---|--|

E. Acquisition Strategy

The MGUE program has developed a comprehensive acquisition strategy to provide modernized GPS capabilities to U.S. and Allied Forces by developing a competitive market driven approach. This strategy establishes the signal compatibility and security criteria along with a process for evaluating components to enable rapid movement from development to fielding. The pillars of this effort are: (a) establishing time certain and low risk development; (b) bounding requirements to leverage mature technology to the maximum extent possible; (c) focusing on the development of form factors based on well-defined standards to support lead platform integration; and (d) implementing a proactive, collaborative MGUE platform integration activity to mitigate risk and reduce cost for DoD force structure modernization.

The MGUE program awarded three sole source contracts for the Inc 1 Technology Development Phase effort in September 2012, as follow-on efforts to the competitively awarded Modernized User Equipment (MUE) contracts awarded in June 2006. The effort spans the Technology Maturation and Risk Reduction Phase through design and includes integration and test of M-Code receivers into Service-nominated lead platforms. This effort also includes the security and compatibility certification of GPS receiver cards as a part of the integration effort. The Service lead platforms will select from the available vendors to integrate and perform operational testing with funding from the MGUE program. This supports compliance with Public Law 111-383, section 913.

The MGUE Inc 2 program developed an Acquisition Strategy to continue MGUE development by: addressing long term producibility of MGUE ASICs, identifying a U.S. owned trusted foundry for ASIC development, delivering GPS receiver cards to meet stringent Inc 2 requirements, and developing a modernized GPS handheld receiver to meet the needs of the Services. The Air Force Service Acquisition Executive approved the MGUE Inc 2 Acquisition Strategy to include designation of two FY 2016 NDAA Section 804, Middle Tier Acquisition Rapid Prototype efforts: 1) Miniature Serial Interface Receiver Card (includes next generation ASIC) and 2) Joint, Modernized Handheld Receiver.

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 1203164F / NAVSTAR Global Positioning System (User Equipment) (SPACE) | Project (Number/Name) 643833 / MILITARY GLOBAL POSITIONING SYSTEM USER EQUIP |
|--|--|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| MGUE Increment 1 Technology Development (Collins Aerospace) | C/CPIF | Collins Aerospace : Cedar Rapids, IA | 125.920 | 10.199 | Nov 2017 | 15.404 | Nov 2018 | 12.584 | Nov 2019 | - | | 12.584 | 5.270 | 169.377 | 169.377 |
| MGUE Increment 1 Technology Development (Raytheon) | C/CPIF | Raytheon : El Segundo, CA | 132.110 | 47.002 | Nov 2017 | 18.000 | Nov 2018 | 8.685 | Nov 2019 | - | | 8.685 | 5.232 | 211.029 | 211.029 |
| MGUE Increment 1 Technology Development (L3) | C/CPIF | L3 : Anaheim, CA | 74.915 | 21.720 | Nov 2017 | 15.800 | Nov 2018 | 5.364 | Nov 2019 | - | | 5.364 | 4.145 | 121.944 | 121.944 |
| MGUE Increment 1 Pre-Tech Development | C/CPAF | Various : Various | 33.888 | 13.041 | Jan 2018 | 8.500 | Jan 2019 | 5.097 | Jan 2020 | - | | 5.097 | 5.500 | 66.026 | - |
| MGUE Increment 1 MGUE Demonstrations | C/CPFF | Various : Various | 19.783 | - | | - | | - | | - | | - | 0.000 | 19.783 | - |
| MGUE Increment 1 Platform Integration | C/CPAF | Various : Various | 134.314 | 40.252 | Nov 2017 | 62.554 | Nov 2018 | 54.726 | Nov 2019 | - | | 54.726 | 8.445 | 300.291 | - |
| MGUE Increment 1 Compatibility Certification | C/CPAF | Various : Various | 11.158 | - | | - | | - | | - | | - | 0.000 | 11.158 | - |
| MGUE Increment 1 Information Assurance | C/CPAF | Various : Various | 17.954 | 2.715 | Jan 2018 | 3.390 | Jan 2019 | 2.706 | Jan 2020 | - | | 2.706 | 5.610 | 32.375 | - |
| MGUE Increment 1 Security Certification | C/CPAF | Various : Various | 28.374 | 3.000 | Jan 2018 | 1.740 | Jan 2019 | 1.756 | Jan 2020 | - | | 1.756 | 3.700 | 38.570 | - |
| MGUE Increment 1 Technical Mission Analysis | MIPR | Various : El Segundo, CA | 22.409 | 19.347 | Oct 2017 | 18.017 | Oct 2018 | 16.352 | Oct 2019 | - | | 16.352 | 17.457 | 93.582 | - |
| MGUE Increment 1 Enterprise SE&I | C/CPAF | Engility : El Segundo, CA | 33.323 | 27.234 | Nov 2017 | 15.561 | Nov 2018 | 16.070 | Nov 2019 | - | | 16.070 | 18.890 | 111.078 | 111.078 |
| MGUE RMP | C/CPIF | Various : Various | 0.000 | - | | 15.400 | Jan 2019 | - | | - | | - | 0.000 | 15.400 | - |
| MGUE Increment 2 ASIC Development | Various | Various : Various | 5.200 | 103.200 | Mar 2018 | 50.753 | Jan 2019 | 139.155 | Jan 2020 | - | | 139.155 | 698.319 | 996.627 | - |
| MGUE Increment 2 Miniature Serial Interface (MSI) Development | C/CPIF | TBD : TBD | 0.000 | - | | - | | 15.400 | Nov 2019 | - | | 15.400 | 48.972 | 64.372 | 64.372 |

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 1203164F / NAVSTAR Global Positioning System (User Equipment) (SPACE) | Project (Number/Name) 643833 / MILITARY GLOBAL POSITIONING SYSTEM USER EQUIP |
|--|--|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| MGUE Increment 2 Handheld Development | C/TBD | TBD : TBD | 0.000 | - | | - | | 9.600 | Nov 2019 | - | | 9.600 | 30.528 | 40.128 | 40.128 |
| MGUE Increment 2 Technical Mission Analysis | MIPR | Various : El Segundo, CA | 0.000 | 2.510 | Oct 2017 | 2.500 | Oct 2018 | 4.100 | Oct 2019 | - | | 4.100 | 13.038 | 22.148 | - |
| MGUE Increment 2 Enterprise SE&I | C/CPAF | Engility : El Segundo, CA | 0.000 | 2.020 | Nov 2017 | 2.000 | Nov 2018 | 11.200 | Nov 2019 | - | | 11.200 | 35.616 | 50.836 | 50.836 |
| Subtotal | | | 639.348 | 292.240 | | 229.619 | | 302.795 | | - | | 302.795 | 900.722 | 2,364.724 | N/A |

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| MGUE Increment 1 Test and Evaluation | Various | Various : San Diego, CA | 13.327 | 4.524 | Jan 2018 | 3.920 | Jan 2019 | 8.732 | Jan 2020 | - | | 8.732 | 1.220 | 31.723 | - |
| Subtotal | | | 13.327 | 4.524 | | 3.920 | | 8.732 | | - | | 8.732 | 1.220 | 31.723 | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| MGUE Increment 1 FFRDC | Various | Various : Various | 45.041 | 6.750 | Dec 2017 | 5.073 | Dec 2018 | 5.929 | Dec 2019 | - | | 5.929 | 5.642 | 68.435 | - |
| MGUE Increment 2 FFRDC | Various | Various : Various | 0.000 | 2.500 | Dec 2017 | 2.500 | Dec 2018 | 2.600 | Dec 2019 | - | | 2.600 | 8.268 | 15.868 | - |
| MGUE Increment 1 A&AS | Various | Various : Various | 24.070 | 13.360 | Dec 2017 | 9.961 | Dec 2018 | 4.163 | Dec 2019 | - | | 4.163 | 6.554 | 58.108 | - |
| MGUE Increment 2 A&AS | Various | Various : Various | 0.000 | 1.400 | Dec 2017 | 1.400 | Dec 2018 | 5.300 | Dec 2019 | - | | 5.300 | 16.854 | 24.954 | - |
| MGUE Increment 1 and Increment 2 Other Support | Various | Various : Various | 1.199 | 0.412 | Dec 2017 | 0.361 | Dec 2018 | 0.429 | Dec 2019 | - | | 0.429 | 0.240 | 2.641 | - |
| Subtotal | | | 70.310 | 24.422 | | 19.295 | | 18.421 | | - | | 18.421 | 37.558 | 170.006 | N/A |

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 1203164F / NAVSTAR Global Positioning System (User Equipment) (SPACE) | Project (Number/Name) 643833 / MILITARY GLOBAL POSITIONING SYSTEM USER EQUIP |
|--|--|---|

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|----------------|---------|---------|-----------------|----------------|------------------|---------------------|---------------|--------------------------------|
| Project Cost Totals | 722.985 | 321.186 | 252.834 | 329.948 | - | 329.948 | 939.500 | 2,566.453 | N/A |

Remarks
Rockwell Collins was acquired by United Technologies Corp. and is now called Collins Aerospace Systems

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 1203164F / NAVSTAR Global Positioning System (User Equipment) (SPACE) | Project (Number/Name) 643833 / MILITARY GLOBAL POSITIONING SYSTEM USER EQUIP |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---|----------------------|---|---|---|--|---|---|---|--|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| MGUE Increment 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MGUE Increment 1 Security Certification | ██████████ | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MGUE Increment 1 Developmental Test | ████████████████████ | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MGUE Increment 1 All Lead Platforms Operational Test | | | | | ██ | | | | | | | | | | | | | | | | | | | | | | | |
| MGUE Increment 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MGUE Increment 2 Next Gen ASIC Studies up to PDR | ████████████████████ | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MGUE Increment 2 Handheld Risk Reduction Activities/Prototypes | | | | | ██ | | | | | | | | | | | | | | | | | | | | | | | |
| MGUE Increment 2 Post PDR Development, Fabrication, Manufacturing, and Test | | | | | | | | | ██ | | | | | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 1203164F / NAVSTAR Global Positioning System (User Equipment) (SPACE) | Project (Number/Name) 643833 / MILITARY GLOBAL POSITIONING SYSTEM USER EQUIP |

Schedule Details

| Events by Sub Project | Start | | End | |
|---|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| MGUE Increment 1 | | | | |
| MGUE Increment 1 Security Certification | 1 | 2018 | 2 | 2019 |
| MGUE Increment 1 Developmental Test | 1 | 2018 | 2 | 2020 |
| MGUE Increment 1 All Lead Platforms Operational Test | 2 | 2019 | 1 | 2022 |
| MGUE Increment 2 | | | | |
| MGUE Increment 2 Next Gen ASIC Studies up to PDR | 1 | 2018 | 4 | 2020 |
| MGUE Increment 2 Handheld Risk Reduction Activities/Prototypes | 3 | 2019 | 2 | 2023 |
| MGUE Increment 2 Post PDR Development, Fabrication, Manufacturing, and Test | 4 | 2020 | 4 | 2024 |

Note

Note: MGUE Increment 1 Security Certification refers to initial security certifications. Security Certifications activities such as delta certifications for all M-Code receivers will continue after FY19 as required.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 1203710F / <i>EO/IR Weather Systems</i> |
|--|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 8.000 | 7.940 | 101.222 | 0.000 | 101.222 | 156.819 | 106.231 | 42.700 | 29.669 | Continuing | Continuing |
| 643730: <i>EO/IR Weather System Dev</i> | - | 8.000 | 7.940 | 101.222 | 0.000 | 101.222 | 156.819 | 106.231 | 42.700 | 29.669 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

Based on completion of the Space-Based Environmental Monitoring (SBEM) Joint Requirements Oversight Council (JROC) Memo 092-14, capabilities will be developed to satisfy weather Gap 1 (Cloud Characterization) and Gap 2 (Theater Weather Imagery). Electro-Optical/Infrared (EO/IR) Weather Systems is a component of SBEM efforts to develop capabilities to satisfy weather Gap 1 (Cloud Characterization) and Gap 2 (Theater Weather Imagery). The earliest possible launch options are being integrated in the design for critical gaps.

Based on the SBEM Analysis of Alternatives (AoA) results, the EO/IR Weather Systems (EWS) initial thrusts will enable:

- 1) DoD use of data collected by civil, international and other DoD space systems;
- 2) Timely weather collection of EWS Program of Record;
- 3) Explore and/or utilize the use of commercially available data.

Secondary investments may be supported to address weather gaps identified in the SBEM AoA and validated by the JROC.

EWS will consist of a Low Earth Orbiting (LEO) Freeflyer space vehicle in a sun-synchronous, early morning orbit and a ground architecture (LEO Ground) for mission data retrieval/processing and telemetry, tracking, and control. EWS will provide environmental monitoring in the Electro-Optical/Infrared (EO/IR) Family of Systems providing coverage to meet Space Based Environmental Monitoring (SBEM) Gaps 1 and 2, Cloud Characterization (CC) and Theater Weather Imagery (TWI).

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) is transforming the organization and implementation of space acquisition to an enterprise approach, maximizing innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose capabilities.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver EWS weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392F and 1206398F.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 1203710F / <i>EO/IR Weather Systems</i> |
|--|--|

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 10.000 | 7.940 | 101.222 | 0.000 | 101.222 |
| Current President's Budget | 8.000 | 7.940 | 101.222 | 0.000 | 101.222 |
| Total Adjustments | -2.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | -2.000 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Change Summary Explanation

FY 2018: -\$2.000M Reprogramming for higher Air Force Space priority

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| <p>Title: Electro-Optical/Infrared Weather System (EWS)</p> <p>Description: EWS will consist of a Low Earth Orbiting (LEO) Freeflyer space vehicle in a sun-synchronous, early morning orbit and a ground architecture (LEO Ground) for mission data retrieval/processing and telemetry, tracking, and control. EWS will provide environmental monitoring in the Electro-Optical/Infrared (EO/IR) Family of Systems providing coverage to meet Space Based Environmental Monitoring (SBEM) Gaps 1 and 2, Cloud Characterization (CC) and Theater Weather Imagery (TWI).</p> <p>FY 2019 Plans: Receive proposals and conduct source selection. Continue to address secondary weather gaps identified in the Meteorological and Oceanographic (METOC) Initial Capabilities Document (ICD). Continue Enterprise Systems Engineering & Integration and Management Services. Risk reduction and pre-acquisition activities leading up to contract award in FY 2020 for EWS. Continue</p> | 8.000 | 7.940 | 101.222 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 1203710F / <i>EO/IR Weather Systems</i> |
|--|--|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| <p>program office support and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc.</p> <p>FY 2020 Plans: Award contract and begin design of EWS to include ground development activities. Conduct subsystem Preliminary Design Reviews (PDRs) for the payload, spacecraft and ground components and prepare for system level PDR in first quarter of FY 2021. Will continue Enterprise Systems Engineering & Integration and Management Services. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 increased compared to FY 2019 by \$93.282M. Justification for this increase is described in plans above.</p> | | | |
| Accomplishments/Planned Programs Subtotals | 8.000 | 7.940 | 101.222 |

| D. Other Program Funding Summary (\$ in Millions) | | | | | | | | | | | |
|--|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|
| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> <u>Base</u> | <u>FY 2020</u> <u>OCO</u> | <u>FY 2020</u> <u>Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To</u> <u>Complete</u> | <u>Total Cost</u> |
| • SPAF 01 SPCMOD: <i>Space Mods</i> | 18.620 | 63.737 | - | - | - | - | - | - | - | 0.000 | 82.357 |
| • RDTE 04 1206857F: <i>Space Rapid Capabilities Office</i> | 57.200 | 69.000 | 24.742 | - | 24.742 | 9.044 | 0.000 | 0.000 | 0.000 | 0.000 | 159.986 |

Remarks

E. Acquisition Strategy
The acquisition strategy for EWS is based on validated SBEM AoA and JROC Memo 033-16 and subsequent acquisition strategy development activities that were conducted in FY 2018. The acquisition strategy for EWS will be finalized in the first quarter of FY 2019 to support an anticipated development RFP release in the second quarter of FY 2019. The program office successfully completed a Materiel Development Decision with the Air Force Program Executive Officer of Space (AFPEO/SP) on 3 May 17, Milestone A and the Acquisition Decision Memorandum on 19 May 17.

F. Performance Metrics
Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|---|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 1203710F / EO/IR Weather Systems | Project (Number/Name) 643730 / EO/IR Weather System Dev |
|--|---|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Pre-Acquisition Activities | Various | Various : Various | - | 6.588 | Jul 2018 | 0.933 | Jun 2019 | - | | - | | - | 0.000 | 7.521 | - |
| LEO Free Flyer | TBD | TBD : TBD | - | - | | - | | 86.608 | Jan 2020 | - | | 86.608 | Continuing | Continuing | - |
| LEO Ground (EGS) | TBD | TBD : TBD | - | - | | - | | 0.100 | Dec 2019 | - | | 0.100 | Continuing | Continuing | - |
| Technical Mission Analysis | RO | Aerospace Corp : El Segundo, CA | - | - | | 2.596 | Nov 2018 | 3.826 | Nov 2019 | - | | 3.826 | Continuing | Continuing | - |
| Enterprise Systems Engineering & Integration | C/CPIF | Engility Corp : Andover, MA | - | - | | 0.643 | Nov 2018 | 2.491 | Nov 2019 | - | | 2.491 | Continuing | Continuing | - |
| Subtotal | | | - | 6.588 | | 4.172 | | 93.025 | | - | | 93.025 | Continuing | Continuing | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| FFRDC | RO | Aerospace Corp : El Segundo, CA | - | 1.412 | Jul 2018 | 1.925 | Nov 2018 | 2.837 | Nov 2019 | - | | 2.837 | Continuing | Continuing | - |
| A&AS | Various | Various : Various | - | - | | 1.684 | Feb 2019 | 3.336 | Feb 2020 | - | | 3.336 | Continuing | Continuing | - |
| Other Support | Various | Various : Various | - | - | | 0.159 | Jun 2019 | 2.024 | Jun 2020 | - | | 2.024 | Continuing | Continuing | - |
| Subtotal | | | - | 1.412 | | 3.768 | | 8.197 | | - | | 8.197 | Continuing | Continuing | N/A |

| Project Cost Totals | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|--------------------|----------------|----------------|---------------------|--------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Project Cost Totals | - | 8.000 | 7.940 | 101.222 | - | 101.222 | Continuing | Continuing | N/A |

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|---|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 1203710F / EO/IR Weather Systems | Project (Number/Name) 643730 / EO/IR Weather System Dev |
|--|---|---|

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|------------------------------------|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| EO/IR Weather Systems (EWS) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| EWS Pre-Acquisition Activities | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| EWS ATP | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| EWS Preliminary Design Review | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| EWS IPR | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| EWS Critical Design Review | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| EWS Development | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| EWS Integration and Testing | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| EWS Initial Launch Capability | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|--|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 1203710F / <i>EO/IR Weather Systems</i> | Project (Number/Name) 643730 / <i>EO/IR Weather System Dev</i> |
|--|--|--|

Schedule Details

| Events by Sub Project | Start | | End | |
|---|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>EO/IR Weather Systems (EWS)</i> | | | | |
| EWS Pre-Acquisition Activities | 2 | 2018 | 2 | 2020 |
| EWS ATP | 2 | 2020 | 2 | 2020 |
| EWS Preliminary Design Review | 1 | 2021 | 1 | 2021 |
| EWS IPR | 2 | 2021 | 2 | 2021 |
| EWS Critical Design Review | 2 | 2022 | 2 | 2022 |
| EWS Development | 2 | 2022 | 1 | 2024 |
| EWS Integration and Testing | 1 | 2024 | 3 | 2024 |
| EWS Initial Launch Capability | 4 | 2024 | 4 | 2024 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|--|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 1206422F / <i>Weather System Follow-on</i> |
|--|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | 276.283 | 98.396 | 138.052 | 225.660 | 0.000 | 225.660 | 54.748 | 34.809 | 36.660 | 38.759 | 297.300 | 1,200.667 |
| 644289: <i>Weather System Follow-On</i> | 276.283 | 98.396 | 138.052 | 225.660 | 0.000 | 225.660 | 54.748 | 34.809 | 36.660 | 38.759 | 297.300 | 1,200.667 |

Program MDAP/MAIS Code: 488

A. Mission Description and Budget Item Justification

Based on completion of the Space-Based Environmental Monitoring (SBEM) JROC Memo 092-14, capabilities will be developed to satisfy weather gaps for which no known mitigation exists. Weather System Follow-on (WSF) is a component of SBEM efforts to develop capabilities to satisfy weather Gap 3 Ocean Surface Vector Winds (OSVW), Gap 8 Tropical Cyclone Intensity (TCI), and Gap 11 Low Earth Orbit (LEO) Energetic Charged Particles (LEO ECP). Gap 3 OSVW and Gap 8 TCI require a space-based microwave sensor to provide polarimetric ocean surface wind direction and speed required for naval sea operations, as well as fighter sortie generations and marine amphibious operations. Gap 11 LEO ECP requires in situ ECP sensor for space situational awareness. The earliest possible launch options are being integrated in the design for critical gaps.

DoD established WSF as a Pre-Major Defense Acquisition Program (MDAP) with the Air force as the lead component. Based on the SBEM AoA results, the WSF initial thrusts will be to enable:

- 1) DoD use of data collected by civil, international and other DoD space systems;
- 2) Timely weather collection over broad oceans in support of maneuvering forces;
- 3) Space weather capabilities to characterize operational orbits, space situational awareness, and the ionosphere.

Secondary investments may be supported to address weather gaps identified in the SBEM AoA and validated by the JROC.

The Military Application of the Space Environment (MASE) is a program to demonstrate mature space environment technology to improve combat operations. MASE will enhance regional ionospheric specification (nowcasts) and predictions (forecasts) affecting signal propagation paths. MASE uses traditional and non-traditional ionospheric measurements in advanced space environment models to forecast and predict impacts to weapon systems. Contributes to satisfying Gaps 4 and 7 of the SBEM AoA results as supplemented by the AFRDM 02-17-02 (SBEM JDCR).

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) is transforming the organization and implementation of space acquisition to an enterprise approach, maximizing innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose capabilities.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|--|---|
| Appropriation/Budget Activity | R-1 Program Element (Number/Name) |
| 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | PE 1206422F / <i>Weather System Follow-on</i> |

This program element may include necessary civilian pay expenses required to manage, execute, and deliver WSF weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392F and 1206398F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 112.088 | 138.052 | 122.897 | 0.000 | 122.897 |
| Current President's Budget | 98.396 | 138.052 | 225.660 | 0.000 | 225.660 |
| Total Adjustments | -13.692 | 0.000 | 102.763 | 0.000 | 102.763 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | -10.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -3.692 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 102.763 | 0.000 | 102.763 |

Change Summary Explanation

FY 2018: -\$10.00M congressional reduction - excess to need

FY 2018: WSF received a Congressional rescission of -\$5.388M. The correct total for FY 2018 is \$93.008M.

FY 2020: \$105.000M increase for SV-1 development; -\$2.237M transfer to dedicated Space Situational Awareness Environmental Monitoring (SSAEM) Project (PE 1206422F/BA05/Project 65A038)

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|---|--------------------|----------------|----------------|---------------------|---|----------------------|----------------|----------------|--|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 4 | | | | | R-1 Program Element (Number/Name) PE 1206422F / <i>Weather System Follow-on</i> | | | | Project (Number/Name) 644289 / <i>Weather System Follow-On</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 644289: <i>Weather System Follow-On</i> | 276.283 | 98.396 | 138.052 | 225.660 | 0.000 | 225.660 | 54.748 | 34.809 | 36.660 | 38.759 | 297.300 | 1,200.667 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | - | - |

A. Mission Description and Budget Item Justification

Based on completion of the Space-Based Environmental Monitoring (SBEM) JROC Memo 092-14, capabilities will be developed to satisfy weather gaps for which no known mitigation exists. Weather System Follow-on (WSF) is a component of SBEM efforts to develop capabilities to satisfy weather Gap 3 Ocean Surface Vector Winds (OSVW), Gap 8 Tropical Cyclone Intensity (TCI), and Gap 11 Low Earth Orbit (LEO) Energetic Charged Particles (LEO ECP). Gap 3 OSVW and Gap 8 TCI require a space-based microwave sensor to provide polarimetric ocean surface wind direction and speed required for naval sea operations, as well as fighter sortie generations and marine amphibious operations. Gap 11 LEO ECP requires in situ ECP sensor for space situational awareness. The earliest possible launch options are being integrated in the design for critical gaps.

DoD established WSF as a Pre-Major Defense Acquisition Program (MDAP) with the Air force as the lead component. Based on the SBEM AoA results, the WSF initial thrusts will be to enable:

- 1) DoD use of data collected by civil, international and other DoD space systems;
- 2) Timely weather collection over broad oceans in support of maneuvering forces;
- 3) Space weather capabilities to characterize operational orbits, space situational awareness, and the ionosphere.

Secondary investments may be supported to address weather gaps identified in the SBEM AoA and validated by the JROC.

The Military Application of the Space Environment (MASE) is a program to demonstrate mature space environment technology to improve combat operations. MASE will enhance regional ionospheric specification (nowcasts) and predictions (forecasts) affecting signal propagation paths. MASE uses traditional and non-traditional ionospheric measurements in advanced space environment models to forecast and predict impacts to weapon systems. Contributes to satisfying Gaps 4 and 7 of the SBEM AoA results as supplemented by the AFRDM 02-17-02 (SBEM JDCR). MASE was a new start in FY 2019.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) is transforming the organization and implementation of space acquisition to an enterprise approach, maximizing innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose capabilities.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver WSF weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392F and 1206398F.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force **Date:** February 2019

| | | |
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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 1206422F / <i>Weather System Follow-on</i> | Project (Number/Name) 644289 / <i>Weather System Follow-On</i> |
|--|---|--|

| | | | |
|---|----------------|----------------|----------------|
| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|

| | | | |
|---|--------|---------|---------|
| Title: WSF Microwave Satellite (SV1-2) | 94.046 | 115.195 | 209.954 |
|---|--------|---------|---------|

Description: WSF Microwave Satellite (SV1-2): The Air Force awarded a contract to Ball Aerospace and Technologies Corp. to develop the WSF - Microwave (WSF-M) Space Vehicle (SV) to meet all three capability gaps. WSF-M SV-2 will be an option to exercise, should AF wish to replenish WSF constellation post-SV-1. SV-2 will be functionally equivalent to SV-1. The WSF-M SV-1 projected Initial Launch Capability (ILC) is FY 2024. Secondary investments may be supported to address weather gaps identified in the SBEM AoA and validated by the JROC.

FY 2019 Plans:

Will complete WSF-M System PDR, WSF-M Milestone B required acquisition documentation, Microwave Imager (MWI) Critical Design Review (CDR), and Spacecraft CDR. Will initiate work on WSF-M System CDR. Continue program office support and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc.

FY 2020 Plans:

Will complete WSF-M System CDR and continue SV-1 development to include purchase of long lead items and spares. Plan for robust spares purchase for SV-1 could potentially support future SV-2 fabrication, should the option be exercised. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, prototyping, technology maturation, etc.

FY 2019 to FY 2020 Increase/Decrease Statement:

FY 2020 increase compared to FY 2019 by \$94.759M. Justification for this increase is described in the plans above.

| | | | |
|-------------------------------|-------|-------|--------|
| Title: COWVR Tech Demo | 3.158 | 5.230 | 14.376 |
|-------------------------------|-------|-------|--------|

Description: The Compact Ocean Surface Wind Vector Radiometer (COWVR) launch objective supports Category A Weather Requirements, as codified in JROC Memo 092-014, providing on-orbit technology demonstration of the new COWVR technology to deliver Weather Gap #3, Ocean Surface Vector Winds (OSVW) and Gap #8, Tropical Cyclone Intensity (TCI). This will be a cooperative mission with NASA for integrating the sensor onto the International Space Station (ISS) as a weather technology demonstration project. The new mission designation for the COWVR launch will be Space Test Program Houston Mission #8 (STP-H8). Demonstrating COWVR technology in the space environment remains an important milestone for the microwave data weather mission in lieu of the ORS-6 cancellation. Unlike ORS-6, COVWR will fly on the International Space Station and there will be no residual operational capability. Due to this restructure, the projected COWVR launch will be delayed from FY 2019 to FY 2021.

FY 2019 Plans:

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| | | | | |
|---|---|--|----------------|----------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 1206422F / <i>Weather System Follow-on</i> | Project (Number/Name) 644289 / <i>Weather System Follow-On</i> | | |
| B. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| <p>Contract awards to NASA STP mission contractors, signed JPL task plan for supporting STP-H8 mission, and completed System Preliminary Design Review (PDR) and Critical Design Review (CDR).</p> <p>FY 2020 Plans: Integration & Test (I&T) for COWVR/ISS; Environmental Tests; Phase 3 NASA Safety review; continued development of COWVR ground processing software; Turnover to NASA. This funding includes but is not limited to payload interface unit, associated electronics, integration, system and environmental testing, launch, and ground operations establishment.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 increased compared to FY 2019 by \$9.146M. Justification for this increase is described in plans above.</p> | | | | |
| <p>Title: ECP</p> <p>Description: Energetic Charged Particles (ECP) will fulfill the Space-based Environmental Monitoring (SBEM) Weather Gap 11 and address the Secretary of the Air Force (SECAF) policy which directs each USAF Satellite Office to plan for and integrate ECP sensors on all pre-Milestone B new satellite acquisitions. To accomplish this requirement, the ECP sensor will be integrated on the WSF-M satellite.</p> <p>Energetic Charged Particle (ECP) Hazard Assessment System (HAS) will be a component of space attack assessment. A commercial sources for Aerospace's ECP-Lite sensor will be established. The ECP sensors will be hosted on international and commercial missions to gain additional flight opportunities, orbital regimes, relationships, and constellation architectures to augment the ECP HAS system with supplemental data.</p> <p>FY 2019 Plans: Complete ECP sensor and put in storage.</p> <p>FY 2020 Plans: Continue testing and storage of the ECP sensor for WSF before delivery to prime contractor.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 increase compared to FY 2019 by \$0.032M. Justification for the increase is described in plans above.</p> | | 1.192 | 1.298 | 1.330 |
| <p>Title: Military Application of the Space Environment (MASE)</p> <p>Description: MASE demonstrates a sensor-to-shooter solution to improve mission effectiveness by providing commanders an operational risk assessment tool. MASE will deliver a capability comprised of weapon system tailored visualizations/decision aids to allow warfighter integration into operational plans and tactics, techniques, and procedures. MASE products and services will be evaluated using quantitative standard measures of performance, effectiveness, and outcome against theater operational requirements.</p> | | - | 16.329 | 0.000 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 1206422F / <i>Weather System Follow-on</i> | Project (Number/Name) 644289 / <i>Weather System Follow-On</i> |

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| <p><i>FY 2019 Plans:</i> Transitioned prototype capability into operations and will continue the R&D effort for future phases.</p> <p><i>FY 2020 Plans:</i> N/A</p> <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> FY 2020 decreased compared to FY 2019 by \$18.4M. Justification for the decrease is described in plans above.</p> | | | |
| Accomplishments/Planned Programs Subtotals | 98.396 | 138.052 | 225.660 |

C. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

D. Acquisition Strategy

DoD established WSF as a pre-MDAP. The acquisition strategy for WSF is based on validated SBEM AoA results from FY2014 and subsequent acquisition strategy development activities that were conducted in FY 2015. The WSF acquisition strategy focuses on streamlined acquisition process for providing materiel solutions to OSVW, TCI & LEO ECP, as validated by the JROC; deliver microwave sensing solution to address DoD needs for OSVW and TCI capabilities and deliver space environment sensing solution to address LEO ECP capabilities for on-orbit attributions and anomaly resolutions.

The Air Force intends to conduct a technology demonstration of the Compact Ocean Surface Wind Vector Radiometer (COWVR) sensor in partnership with NASA Space Test Program (STP) to launch and integrate with International Space Station (ISS), utilizing their unique technology demonstration capabilities for on-orbit demonstration of COWVR technology. SMC's STP-Houston detachment will be leading AF organization spearheading NASA partnership, with RS for funding and programmatic support to enable sensor to ISS integration/technology demonstration by 1Q FY21.

The program awarded a contract for WSF satellite, capable of meeting all three weather capability gaps, in a full and open competition environment, in order to reduce overall program cost. The Air Force is procuring one WSF-M satellite with an option for a second satellite. WSF-M first satellite (SV-1) ILC is FY 2024 to mitigate any potential weather coverage gaps. WSF-M SV-2 ILC is currently projected for FY 2028. The WSF SV-2 will be functionally equivalent to SV-1.

The WSF ECP sensor development will leverage current AFRL sensor and hazard assessment technology to accelerate availability of ECP sensor for integration on WSF-M and other planned AF satellite acquisitions. The AF intends to transition AFRL's technology to industry for production via competitive award. Two Tech Demo ECP sensors are projected to be delivered and ready for satellite integration by FY 2021. Post-Tech Demo ECP phase, each respective program offices will be responsible for the procurement/integration and sustainment of the sensors required to meet the SecAF's Space Situational Awareness (SSA) policy.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force Date: February 2019

| Appropriation/Budget Activity | R-1 Program Element (Number/Name) | Project (Number/Name) |
|-------------------------------|---|--|
| 3600 / 4 | PE 1206422F / <i>Weather System Follow-on</i> | 644289 / <i>Weather System Follow-On</i> |

The program intends to continue research and development at AFRL to support the MASE baseline. Features to enhance and improve MASE related prototypes/models will be added through capability drops while maintaining Risk Management Framework compliance. Award contracts to conduct studies and perform technical analysis for external data sources and optimal sensor laydown, system development and external system integration. Conduct field campaigns to validate scientific algorithms. Provision cloud services, deploy ionospheric ground sensors and provide program office support.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|--|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 1206422F / <i>Weather System Follow-on</i> | Project (Number/Name) 644289 / <i>Weather System Follow-On</i> |
|--|---|--|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|---------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| COWVR Technology Demonstration | Various | Various : Various | 50.745 | 3.157 | Oct 2018 | 5.230 | Apr 2019 | 14.376 | Apr 2020 | - | | 14.376 | 0.000 | 73.508 | - |
| WSF Microwave System (SV1-2) | C/FFP | Ball Aerospace : Boulder, CO | 48.044 | 71.832 | Nov 2018 | 64.065 | Nov 2018 | 182.674 | Nov 2019 | - | | 182.674 | Continuing | Continuing | - |
| ECP | Various | Various : Various, NM | 4.339 | 1.192 | Aug 2018 | 11.298 | Aug 2019 | 1.330 | Aug 2020 | - | | 1.330 | Continuing | Continuing | - |
| ECP Prototyping | TBD | TBD : TBD | 0.000 | - | | 10.000 | | - | | - | | - | 0.000 | 10.000 | - |
| MASE | Various | Various : Various, CO | 0.000 | - | | 16.329 | Dec 2018 | - | | - | | - | Continuing | Continuing | - |
| Enterprise Systems Engineering & Integration | C/CPIF | Engility Corp. : Andover, MA | 1.605 | 2.735 | Dec 2017 | 4.794 | Nov 2018 | 3.506 | Nov 2019 | - | | 3.506 | Continuing | Continuing | - |
| Technical Mission Analysis | RO | Aerospace Corp : El Segundo, CA | 6.574 | 4.260 | Oct 2017 | 5.649 | Oct 2018 | 5.789 | Oct 2019 | - | | 5.789 | Continuing | Continuing | - |
| Weather Studies (Formerly BAA) | Various | Various : Various, CA | 1.960 | 4.529 | Mar 2018 | 0.500 | | - | | - | | - | 0.000 | 6.989 | - |
| Ground | TBD | TBD : TBD | 0.000 | 1.670 | Dec 2017 | 6.911 | Dec 2018 | 5.734 | Dec 2019 | - | | 5.734 | 0.000 | 14.315 | - |
| Pre-Acquisition Activities | Various | Various : Various | 121.704 | - | | - | | - | | - | | - | 0.000 | 121.704 | - |
| Subtotal | | | 234.971 | 89.375 | | 124.776 | | 213.409 | | - | | 213.409 | Continuing | Continuing | N/A |

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|---|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Requirements/Engineering Analysis Support | RO | Defense Information Technical Center : El Segundo, CA | 1.543 | - | | - | | - | | - | | - | 0.000 | 1.543 | - |
| Engineering Risk Reduction Studies | Various | Various : Various | 1.711 | - | | - | | - | | - | | - | 0.000 | 1.711 | - |
| Subtotal | | | 3.254 | - | | - | | - | | - | | - | 0.000 | 3.254 | N/A |

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 1206422F / <i>Weather System Follow-on</i> | Project (Number/Name) 644289 / <i>Weather System Follow-On</i> |
|--|---|--|

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|---------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| FFRDC | RO | Aerospace Corp : El Segundo, CA | 21.312 | 4.260 | Oct 2017 | 4.189 | Oct 2018 | 4.293 | Nov 2019 | - | | 4.293 | Continuing | Continuing | - |
| Other Support | Various | Various : Various | 4.819 | 2.734 | Nov 2017 | 3.001 | Nov 2018 | 2.625 | Nov 2019 | - | | 2.625 | Continuing | Continuing | - |
| A&AS | Various | Various : Various | 11.927 | 2.027 | Nov 2017 | 6.086 | Nov 2018 | 5.333 | Nov 2019 | - | | 5.333 | Continuing | Continuing | - |
| Subtotal | | | 38.058 | 9.021 | | 13.276 | | 12.251 | | - | | 12.251 | Continuing | Continuing | N/A |
| Project Cost Totals | | | 276.283 | 98.396 | | 138.052 | | 225.660 | | - | | 225.660 | Continuing | Continuing | N/A |

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|--|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 1206422F / <i>Weather System Follow-on</i> | Project (Number/Name) 644289 / <i>Weather System Follow-On</i> |
|--|---|--|

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|--|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| <i>Weather System Follow-On</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| COWVR Technology Demonstration Kickoff | | | | ■ | | | | | | | | | | | | | | | | | | | | | | | | |
| COWVR Technology Demonstration PDR | | | | | ■ | | | | | | | | | | | | | | | | | | | | | | | |
| COWVR Technology Demonstration CDR | | | | | | | | ■ | | | | | | | | | | | | | | | | | | | | |
| COWVR Technology Demonstration I&T | | | | | | | | | ■ | | | | | | | | | | | | | | | | | | | |
| COWVR Technology Demonstration Launch Ops | | | | | | | | | | ■ | | | | | | | | | | | | | | | | | | |
| COWVR Technology Demonstration On-Orbit Operations | | | | | | | | | | | ■ | | | | | | | | | | | | | | | | | |
| WSF Microwave System ATP | ■ | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WSF Microwave System Preliminary Design Review | | | | ■ | | | | | | | | | | | | | | | | | | | | | | | | |
| WSF Microwave System Milestone B | | | | | ■ | | | | | | | | | | | | | | | | | | | | | | | |
| WSF ECP Delta CDR | | | | | ■ | | | | | | | | | | | | | | | | | | | | | | | |
| WSF Microwave System CDR | | | | | | | | ■ | | | | | | | | | | | | | | | | | | | | |
| WSF Microwave System Integration and Test | | | | | | | | | | | | | | | ■ | | | | | | | | | | | | | |
| WSF Microwave Initial Launch Capability | | | | | | | | | | | | | | | | | | | | | | | | ■ | | | | |
| <i>MASE</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MASE Leave Behind Capability | | | | | | | | ■ | | | | | | | | | | | | | | | | | | | | |
| MASE MSB | | | | ■ | | | | | | | | | | | | | | | | | | | | | | | | |
| MASE Award Contracts | | | | ■ | | | | | | | | | | | | | | | | | | | | | | | | |
| MASE Capability Drops | | | | | | | | ■ | | | | | | | | | | | | | | | | | | | | |
| <i>SMC/AD ECP ATP</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| AD ECP Contract Award | | | | | | | | ■ | | | | | | | | | | | | | | | | | | | | |

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|--|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 1206422F / <i>Weather System Follow-on</i> | Project (Number/Name) 644289 / <i>Weather System Follow-On</i> |
|--|---|--|

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Weather System Follow-On</i> | | | | |
| COWVR Technology Demonstration Kickoff | 1 | 2019 | 1 | 2019 |
| COWVR Technology Demonstration PDR | 2 | 2019 | 2 | 2019 |
| COWVR Technology Demonstration CDR | 4 | 2019 | 4 | 2019 |
| COWVR Technology Demonstration I&T | 1 | 2020 | 3 | 2020 |
| COWVR Technology Demonstration Launch Ops | 4 | 2020 | 1 | 2021 |
| COWVR Technology Demonstration On-Orbit Operations | 1 | 2021 | 1 | 2024 |
| WSF Microwave System ATP | 1 | 2018 | 1 | 2018 |
| WSF Microwave System Preliminary Design Review | 1 | 2019 | 1 | 2019 |
| WSF Microwave System Milestone B | 2 | 2019 | 2 | 2019 |
| WSF ECP Delta CDR | 2 | 2019 | 2 | 2019 |
| WSF Microwave System CDR | 1 | 2020 | 1 | 2020 |
| WSF Microwave System Integration and Test | 1 | 2022 | 3 | 2023 |
| WSF Microwave Initial Launch Capability | 1 | 2024 | 1 | 2024 |
| <i>MASE</i> | | | | |
| MASE Leave Behind Capability | 2 | 2019 | 4 | 2019 |
| MASE MSB | 1 | 2019 | 1 | 2019 |
| MASE Award Contracts | 1 | 2019 | 1 | 2019 |
| MASE Capability Drops | 2 | 2019 | 4 | 2019 |
| <i>SMC/AD ECP ATP</i> | | | | |
| AD ECP Contract Award | 2 | 2019 | 2 | 2019 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|--|--|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 1206425F / <i>Space Situation Awareness Systems</i> |
|--|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|--|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 43.290 | 33.469 | 29.776 | 0.000 | 29.776 | 33.370 | 141.296 | 256.684 | 295.430 | Continuing | Continuing |
| 640290: <i>Deep Space Advanced Radar Concept</i> | - | 43.290 | 33.469 | 29.776 | 0.000 | 29.776 | 33.370 | 141.296 | 256.684 | 295.430 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

Deep Space Advanced Radar Concept (DARC) will leverage ongoing defense science and technology efforts to mature radar concepts and technologies to develop and evaluate prototypes that demonstrate increased sensitivity, capacity, search rates, and scalability to detect, track and maintain custody of objects in deep space orbit. This effort will analyze and select the most promising technologies to move forward into system development and operations and a program of record (PoR). DARC will augment the Space Surveillance Network (SSN) as an additional sensor with increased capacity and capability for deep space object custody at Geosynchronous Earth Orbit (GEO).

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) is transforming the organization and implementation of space acquisition to an enterprise approach, maximizing innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose capabilities.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver the weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392F and 1206398F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|---|
| Appropriation/Budget Activity 3600: Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P) | R-1 Program Element (Number/Name) PE 1206425F I Space Situation Awareness Systems |
|---|---|

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 34.764 | 39.338 | 29.776 | 0.000 | 29.776 |
| Current President's Budget | 43.290 | 33.469 | 29.776 | 0.000 | 29.776 |
| Total Adjustments | 8.526 | -5.869 | 0.000 | 0.000 | 0.000 |
| • Congressional General Reductions | 0.000 | -0.869 | | | |
| • Congressional Directed Reductions | 0.000 | -5.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 10.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -1.474 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Change Summary Explanation

FY 2018: \$10.000M Congressional increase to accelerate prototype design efforts.

FY 2019: \$5.000M Congressional reduction for insufficient justification.

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
|---|----------------|----------------|----------------|

| | | | |
|--|--------|--------|-------|
| Title: DARC Technology Maturation and Prototype Development | 43.290 | 33.469 | 0.000 |
|--|--------|--------|-------|

Description: Leverage ongoing defense science and technology efforts to mature radar concepts and technologies, develop and evaluate prototypes that demonstrate increased sensitivity, capacity, search rates, and scalability to detect, track and maintain custody of objects in deep space orbit. Provide technical support to oversee the design, development and demonstration of the DARC Prototype radar. Initiate Program of Record (PoR) for the DARC global radar capability. Current funding supports completion of the DARC Prototype and demonstration effort, standup of the DARC System Program Office (SPO), award of contract for the DARC global radar capability, and completion of the Engineering, Manufacturing, and Development (EMD) of the first site through Critical Design Review (CDR).

FY 2019 Plans:

Continue DARC Prototype build and testing. Conduct demonstrations with the DARC Prototype radar. Prepare for and complete Materiel Development Decision (MDD) milestone for the Program of Record (PoR) to develop and deploy the DARC global radar capability. Stand up DARC System Program Office (SPO), prepare milestone documentation, draft Request for Proposal (RFP), begin developing technical baseline. Continue program office support and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc.

FY 2020 Plans:

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|---|--|--|----------------|----------------|
| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | | R-1 Program Element (Number/Name) PE 1206425F / <i>Space Situation Awareness Systems</i> | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| <p>Complete DARC Prototype build. Begin DARC prototype radar testing. Conduct risk reduction activities to address Mission Management software and Signal Processing for DARC. These risk reduction activities are key to successful transition from prototype activities to operational system development. Advances in Mission Management and Signal Processing may also be advantageous to existing and planned radar upgrades. Prepare for and release RFP for DARC Program of Record (PoR) to develop and deploy the DARC global radar capability. Continue developing technical baseline. Rapidly respond and implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 decreased compared to FY 2019 by \$33.469M. Justification for this decrease is described above.</p> | | | | |
| <p>Title: DARC Site 1 Operational Capability</p> <p>Description: Leverage ongoing DARC Technology Maturation and Prototype Development efforts and defense science and technology efforts to initiate program of record (PoR) for the DARC global radar capability. Supports standup of the DARC System Program Office, award of contract for the DARC global radar capability, and completion of the engineering, manufacturing, and development of the first site through critical design review (CDR).</p> <p>FY 2019 Plans: N/A</p> <p>FY 2020 Plans: Prepare for and release RFP for DARC PoR to develop and deploy the DARC global radar capability. Investigate and conduct activities to reduce risk for the DARC program. Rapidly respond to and implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to, program office support, studies, technical analysis, experimentation, prototyping, etc.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 increased compared to FY 2019 by \$29.776M. Justification for this increase is described above.</p> | | 0.000 | 0.000 | 29.776 |
| Accomplishments/Planned Programs Subtotals | | 43.290 | 33.469 | 29.776 |
| D. Other Program Funding Summary (\$ in Millions) | | | | |
| N/A | | | | |
| Remarks | | | | |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force Date: February 2019

| Appropriation/Budget Activity | R-1 Program Element (Number/Name) |
|--|--|
| 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | PE 1206425F / <i>Space Situation Awareness Systems</i> |

E. Acquisition Strategy
Project utilizes existing DoD engineering and study contracts and activities to conduct science and technology development and data analysis activities. Preliminary/critical design effort commenced in FY 2017. A Broad Agency Announcement (BAA) was used to award seven Integrated System Engineering Team (ISET) contracts which allow for organizations to participate and gain insight into the prototype design and build. DARC PoR will be a full and open industry competition.

F. Performance Metrics
Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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| Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force | | | | | | | | | | | | Date: February 2019 | | | |
|---|------------------------|-----------------------------------|-------------|---|------------|---------|------------|--|------------|-------------|------------|---------------------|------------------|------------|--------------------------|
| Appropriation/Budget Activity | | | | R-1 Program Element (Number/Name) | | | | Project (Number/Name) | | | | | | | |
| 3600 / 4 | | | | PE 1206425F / Space Situation Awareness Systems | | | | 640290 / Deep Space Advanced Radar Concept | | | | | | | |
| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | | | |
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | Target Value of Contract |
| DARC Concept Definition, Prototype Development and Analysis | Various | Various : Various | - | 34.993 | Jan 2018 | 26.064 | Apr 2019 | - | | - | | - | Continuing | Continuing | - |
| Engineering, Manufacturing, & Development (EMD) | TBD | TBD : TBD | - | - | | - | | 17.773 | Jul 2020 | - | | 17.773 | Continuing | Continuing | - |
| Subtotal | | | - | 34.993 | | 26.064 | | 17.773 | | - | | 17.773 | Continuing | Continuing | N/A |
| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | | | |
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | Target Value of Contract |
| Prototype System and Sustainment Analyses | PO | AFRL : Albuquerque, NM | - | 4.000 | Jan 2018 | 3.000 | Jan 2019 | 0.010 | Jan 2020 | - | | 0.010 | Continuing | Continuing | - |
| Subtotal | | | - | 4.000 | | 3.000 | | 0.010 | | - | | 0.010 | Continuing | Continuing | N/A |
| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | | | |
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | Target Value of Contract |
| A&AS | Various | Various : Various | - | 1.480 | Dec 2017 | 1.200 | Dec 2018 | 5.350 | Jul 2020 | - | | 5.350 | Continuing | Continuing | - |
| FFRDC | SS/FP | MITRE Corp : Colorado Springs, CO | - | 2.757 | Oct 2017 | 3.155 | Oct 2018 | 6.100 | Jul 2020 | - | | 6.100 | Continuing | Continuing | - |
| Other Support | Various | SMC/SYG : Colorado Springs, CO | - | 0.060 | Oct 2017 | 0.050 | Oct 2018 | 0.543 | Jul 2020 | - | | 0.543 | Continuing | Continuing | - |
| Subtotal | | | - | 4.297 | | 4.405 | | 11.993 | | - | | 11.993 | Continuing | Continuing | N/A |
| Project Cost Totals | | | - | 43.290 | | 33.469 | | 29.776 | | - | | 29.776 | Continuing | Continuing | N/A |

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|--|--------------------|----------------|--|---------------------|--------------------|---|----------------------------|-------------------|---------------------------------|--|
| Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force | | | | | | | Date: February 2019 | | | |
| Appropriation/Budget Activity 3600 / 4 | | | R-1 Program Element (Number/Name) PE 1206425F / <i>Space Situation Awareness Systems</i> | | | Project (Number/Name) 640290 / <i>Deep Space Advanced Radar Concept</i> | | | | |
| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract | |

Remarks

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 1206425F / <i>Space Situation Awareness Systems</i> | Project (Number/Name) 640290 / <i>Deep Space Advanced Radar Concept</i> |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|--|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| DARC | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Prototype Design | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Prototype Build and Test | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Operational Demonstrations | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Material Development Decision | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Program of Record Stand Up | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Develop Documentation and Request for Proposal | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Milestone B | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Request for Proposal Release | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Source Selection | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Contract Award | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Site 1 Development | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 1206425F / <i>Space Situation Awareness Systems</i> | Project (Number/Name) 640290 / <i>Deep Space Advanced Radar Concept</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| DARC | | | | |
| Prototype Design | 1 | 2018 | 3 | 2018 |
| Prototype Build and Test | 4 | 2018 | 3 | 2020 |
| Operational Demonstrations | 4 | 2020 | 4 | 2020 |
| Material Development Decision | 2 | 2019 | 2 | 2019 |
| Program of Record Stand Up | 3 | 2019 | 4 | 2019 |
| Develop Documentation and Request for Proposal | 1 | 2020 | 2 | 2020 |
| Milestone B | 3 | 2020 | 3 | 2020 |
| Request for Proposal Release | 4 | 2020 | 4 | 2020 |
| Source Selection | 1 | 2021 | 3 | 2021 |
| Contract Award | 4 | 2021 | 4 | 2021 |
| Site 1 Development | 4 | 2021 | 3 | 2024 |

Note
DARC Site 1 estimated completion date and initial operating capability (IOC) is FY 2025.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|--|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 1206427F / <i>Space Systems Prototype Transitions (SSPT)</i> |
|--|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|--|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 0.000 | 0.000 | 142.045 | 0.000 | 142.045 | 142.855 | 100.265 | 77.584 | 76.065 | Continuing | Continuing |
| 645601: <i>Space System Prototype Transition</i> | - | 0.000 | 0.000 | 142.045 | 0.000 | 142.045 | 142.855 | 100.265 | 77.584 | 76.065 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

Note
 Note: This program, BA 04 PE 1206427F, project 645601, Space System Prototype Transition projects were previously funded in the Space Control Technology, PE 1206438F, Space Rapid Capabilities Office (SpRCO), PE 1206857F and Evolved Expendable Launch Vehicle (EELV) PE 1206853F.

A. Mission Description and Budget Item Justification

The Space System Prototype Transition (SSPT) Program will identify and address space technology and capability gaps in order to facilitate technology transition to military space prototypes and programs of record. It will conduct a wide array of activities to model, integrate, test, and provide launch integration and support on-orbit testing of prototype technologies. The supported activities include: systems engineering, technology planning, development, demonstrations and testing, as well as modeling, simulations and exercises to support the development and maturation of tactics and procedures. This includes the development and prototyping of critical technology within the Department of Defense, across other government agencies, academic institutions and industry partners that are identified and the necessary systems engineering to effectively employ such systems.

Specifically the SSPT project will include a cost-effective framework to identify, mature and transition demonstrations and prototypes to:

- Rapidly address identified technology or capability gaps
- Accelerate the maturation of systems intended demonstration/prototype that enhances/augment/compliment/replace an existing capability
- Support a more reliable, available, maintainable and survivable military space enterprise
- Energize the space industrial base supporting U.S. national security
- Focus S&T Innovation and facilitate its transition to military space programs of record

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) is transforming the organization and implementation of space acquisition to an enterprise approach, maximizing innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose capabilities.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver SSPT capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392F and 1206398F.

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 1206427F / <i>Space Systems Prototype Transitions (SSPT)</i> |
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Reduce 1 Payload Adapter Long Duration Propulsive ESPA (LDPE) saved \$27.1M in FY 2020. Reduce 1 LDPE Description: Identified reduced requirement in core LDPE hardware items in FY 2020; decreases from two to one LDPE hardware items with minimal impact to the program. Funds redirected to support rapid prototype development and deployment.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Current President's Budget | 0.000 | 0.000 | 142.045 | 0.000 | 142.045 |
| Total Adjustments | 0.000 | 0.000 | 142.045 | 0.000 | 142.045 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 142.045 | 0.000 | 142.045 |

Change Summary Explanation

FY 2020: Transfers \$142.045M into new Program Element (PE) to consolidate funding of plans, development, field, test and transition of space system prototype technologies for increased efficiency and transparency.

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| Title: Technology Maturation and Prototype Development | 0.000 | 0.000 | 113.895 |
| Description: Plan, develop, test and transition advanced technologies into space system prototypes and capabilities to meet known and emerging threats. Conduct architecture studies, modeling and simulation, technical development, integration and test activities in preparation for transition of critical technologies into prototypes or space programs of record. Develop advanced capabilities for rapid prototyping and integration into space system programs of record and, if requested, to warfighter Urgent | | | |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | | R-1 Program Element (Number/Name) PE 1206427F / <i>Space Systems Prototype Transitions (SSPT)</i> | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| Operational Needs (UONs) and Joint Urgent Operational Needs (JUONs). Capitalize on rideshare opportunities and excess booster lift capacity to enable technology demonstrations and prototype experimental operations. | | | | |
| FY 2019 Plans: N/A | | | | |
| FY 2020 Plans: Continue prototype/technology developments across multiple mission areas, including but not limited to: - Long Duration Propulsive (Evolved Expendable Launch Vehicle (EELV) Secondary Payload Adaptor (ESPA)) (LDPE): Complete and deliver LDPE-2 and begin design, assembly, and integration and testing of LDPE-3 to support on-orbit technology demonstrations and prototypes. - Tetra: Continue development of Tetra-2 and -3 prototypes. Develop Tetra-4 micro-satellite to support experimentation and Tactics, Techniques and Procedure (TTP) development at Geostationary Earth Orbit (GEO). - Blackjack: Continue technical analysis, design, development, test, integration and delivery of prototype, cyber, ground and data processing architecture as well as develop concepts of operations to support Command and Control (C2) system integration. - Quasi-Zenith Satellite System (QZSS)- Hosted Payload (HP) development (International Cooperation): Continue design, development, build and test of the Hosted Payload Interface Unit and Space Situational Awareness (SSA) sensor for integration into a single payload intended for hosting on Japanese QZSS-HP. - Continue engineering of the XVI communications sensor prototype that will be used to develop concepts of operations to support Command and Control (C2) system integration. Air Force Research Laboratory's (AFRL) and SMC/AD's co-developed Sensor XVI prototype is a path-agnostic communications sensor for tactical fighters from Low Earth Orbit (LEO). Continue on orbit operations and data analysis. - Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc. | | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 increased compared to FY 2019 by \$113.895M. Justification for this increase is described in plans above. | | | | |
| Title: Prototype Integration, Test and On-Orbit Prototype Demonstration | | 0.000 | 0.000 | 28.150 |
| Description: Provide rideshare opportunities for prototypes and experiments, fund mission-unique payload integration to the rideshare or launch system, and conduct launch base integration, testing and launch operations. Conduct prototype integration and testing into the designated Command and Control system and provide operational support to conduct prototype testing, demonstration and operations. | | | | |
| FY 2019 Plans: | | | | |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 1206427F / <i>Space Systems Prototype Transitions (SSPT)</i> |
|--|---|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| N/A | | | |
| <p><i>FY 2020 Plans:</i> Provide launch services, mission-unique payload integration, testing and launch operations for prototypes and experiments, to include but not limited to:</p> <ul style="list-style-type: none"> - LDPE-2: Provide systems and subsystems level baselines, architecture and integration planning and support for LDPE -2 payload providers and pre-launch readiness reviews and support. - Tetra-2: Provide payload integration and testing support for Tetra-2. - Prototype experimental operations in support of LDPE-2 and Tetra-2 - Blackjack: Conduct technical reviews, integration and testing of prototypes with launch vehicle in support of launch and on-orbit demonstrations. - AFRL Sensor XVI continue Assembly Integration and Test (AI&T) and launch integration. <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> FY 2020 increased compared to FY 2019 by \$28.150M. Justification for this increase is described in plans above.</p> | | | |
| Accomplishments/Planned Programs Subtotals | 0.000 | 0.000 | 142.045 |

D. Other Program Funding Summary (\$ in Millions)
N/A

Remarks

E. Acquisition Strategy
All contracts funded in this program element will be awarded using competitive procedures to the maximum extent possible. The SSPT program consists of numerous small projects in which the program office will leverage rapid prototyping authorities to the maximum extent possible.

F. Performance Metrics
Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 1206427F / <i>Space Systems Prototype Transitions (SSPT)</i> | Project (Number/Name) 645601 / <i>Space System Prototype Transition</i> |
|--|---|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|--|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| TETRA-2 Integration & On-Orbit Prototype Demonstration | TBD | Various : Various | - | 0.000 | | 0.000 | | 2.350 | Nov 2019 | - | | 2.350 | Continuing | Continuing | - |
| TETRA 3 & 4 Development | C/FFP | TBD : TBD | - | 0.000 | | 0.000 | | 11.660 | Nov 2019 | - | | 11.660 | Continuing | Continuing | - |
| Sensor XVI | TBD | TBD : TBD | - | 0.000 | | 0.000 | | 1.150 | Jan 2020 | - | | 1.150 | Continuing | Continuing | - |
| LDPE-2 Launch Vehicle Integration & Ops | TBD | Northrop Grumman Info Sys : Dulles, VA | - | 0.000 | | 0.000 | | 11.000 | Nov 2019 | - | | 11.000 | Continuing | Continuing | - |
| LDPE-3 Development | C/CPFF | Northrop Grumman Info Sys : Dulles, VA | - | 0.000 | | 0.000 | | 31.694 | Apr 2020 | - | | 31.694 | Continuing | Continuing | - |
| Blackjack Development | MIPR | Various : Various | - | 0.000 | | 0.000 | | 55.000 | Nov 2019 | - | | 55.000 | Continuing | Continuing | - |
| QZSS-HP Development | Various | Various : Various | - | 0.000 | | 0.000 | | 20.369 | Nov 2019 | - | | 20.369 | Continuing | Continuing | - |
| Enterprise SE&I | TBD | Various : TBD | - | 0.000 | | 0.000 | | 2.540 | Dec 2019 | - | | 2.540 | Continuing | Continuing | - |
| Subtotal | | | - | 0.000 | | 0.000 | | 135.763 | | - | | 135.763 | Continuing | Continuing | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| FFRDC | MIPR | Various : Various | - | 0.000 | | 0.000 | | 3.600 | Jan 2020 | - | | 3.600 | Continuing | Continuing | - |
| A&AS | Various | Various : Various | - | - | | - | | 2.342 | Feb 2020 | - | | 2.342 | Continuing | Continuing | - |
| Other Support | Various | Various : El Segundo, CA | - | 0.000 | | 0.000 | | 0.340 | Oct 2019 | - | | 0.340 | Continuing | Continuing | - |
| Subtotal | | | - | 0.000 | | 0.000 | | 6.282 | | - | | 6.282 | Continuing | Continuing | N/A |

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract | | |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|------------|-----|
| Project Cost Totals | | - | 0.000 | 0.000 | 142.045 | - | | 142.045 | Continuing | Continuing | N/A |

Remarks

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 1206427F / <i>Space Systems Prototype Transitions (SSPT)</i> | Project (Number/Name) 645601 / <i>Space System Prototype Transition</i> |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| Technology Maturation and Prototype Development | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TETRA 2 Development | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TETRA 3 Development | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TETRA 4 Development | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sensor XVI | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| LDPE-2 Development | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| LDPE-3 Development | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Blackjack Development | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| QZSS-HP: HPIU Development | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| QZSS-HP: SSA Development | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Technology Maturation and Prototype | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Prototype Integration, Test and On-Orbit Prototype Demonstration | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TETRA 2 Launch and On-Orbit Prototype Demonstration | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Senor XVI and On-Orbit Prototype Demonstration | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| LDPE-2 Launch and On-Orbit Prototype Demonstration | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Blackjack Launch/Support Activities | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Prototype Integration, Test and On-Orbit Prototype | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 1206427F / <i>Space Systems Prototype Transitions (SSPT)</i> | Project (Number/Name) 645601 / <i>Space System Prototype Transition</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Technology Maturation and Prototype Development</i> | | | | |
| TETRA 2 Development | 1 | 2020 | 2 | 2020 |
| TETRA 3 Development | 1 | 2020 | 2 | 2021 |
| TETRA 4 Development | 3 | 2020 | 2 | 2022 |
| Sensor XVI | 1 | 2020 | 2 | 2021 |
| LDPE-2 Development | 1 | 2020 | 2 | 2020 |
| LDPE-3 Development | 1 | 2020 | 2 | 2022 |
| Blackjack Development | 1 | 2020 | 4 | 2020 |
| QZSS-HP: HPIU Development | 1 | 2020 | 2 | 2022 |
| QZSS-HP: SSA Development | 1 | 2020 | 2 | 2022 |
| Technology Maturation and Prototype | 1 | 2020 | 4 | 2024 |
| <i>Prototype Integration, Test and On-Orbit Prototype Demonstration</i> | | | | |
| TETRA 2 Launch and On-Orbit Prototype Demonstration | 1 | 2020 | 2 | 2022 |
| Senor XVI and On-Orbit Prototype Demonstration | 3 | 2020 | 2 | 2021 |
| LDPE-2 Launch and On-Orbit Prototype Demonstration | 1 | 2020 | 2 | 2022 |
| Blackjack Launch/Support Activities | 4 | 2020 | 4 | 2022 |
| Prototype Integration, Test and On-Orbit Prototype | 1 | 2020 | 4 | 2024 |

Note

This program was previously funded from the Space Control Technology, PE 1206438F, Space Rapid Capabilities Office (SpRCO), PE 1206857F and Evolved Expendable Launch Vehicle (EELV) PE 1206853F.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 1206434F / <i>Midterm Polar MILSATCOM System</i> |
|--|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|-------------------------------------|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | 6.000 | 60.123 | 383.113 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 449.236 |
| 643720: <i>EPS Recapitalization</i> | 6.000 | 60.123 | 383.113 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 449.236 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | - | - |

Program MDAP/MAIS Code: 121

Note
In FY 2020, Project 643720, EPS Recapitalization, funds transferred to PE 1206432F, Polar MILSATCOM (SPACE), Project 654215, EPS Recap, in order to better align with the Enhanced Polar System program.

A. Mission Description and Budget Item Justification
The Enhanced Polar System Recapitalization (EPS-R) program will provide continuous, protected, Low Probability of Intercept/Low Probability of Detection communications to tactical and strategic warfighters in the North Polar Region in benign and contested environments. EPS-R will develop and acquire 1) two Extremely High Frequency (EHF) payloads, using Advanced EHF's eXtended Data Rate (XDR) waveform, on hosted spacecraft, 2) upgrades/modifications to the existing Enhanced Polar System (EPS) Control and Planning Segment (CAPS) to provide command and control and XDR mission planning capability, and 3) upgrades/modifications to the existing EPS gateway to provide connectivity between polar and midlatitude users through the Global Information Grid.

The EPS-R program is timed to prevent a gap in Arctic Military Satellite Communications (MILSATCOM) coverage after EPS end of life. To ensure polar MILSATCOM continuity beyond FY 2025, the DoD has begun funding activities to bridge the gap between the current EPS program and future protected systems being planned for the late 2020s. The EPS-R program has examined performance, mission needs, schedules, and costs to avoid a mission gap. EPS-R intends to host the payloads on a Space Norway bus, which is scheduled to launch in CY 2022. EPS-R will reuse EPS Gateway and ground control elements to the greatest extent feasible.

To meet the warfighter requirements for protected tactical and strategic polar MILSATCOM, RDT&E funding is required to continue program office and other related support activities that may include, but are not limited to studies, technical analysis, architectural development, acquisition strategy development, system requirements and system trades analysis, risk reduction activities, technology maturation, System Engineering, Integration and Test of all polar MILSATCOM segments and hosted payloads.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) is transforming the organization and implementation of space acquisition to an enterprise approach, maximizing innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose capabilities.

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 1206434F / <i>Midterm Polar MILSATCOM System</i> |
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This program element may include necessary civilian pay expenses required to manage, execute, and deliver EPS-R capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392F and 1206398F.

In FY 2018, Midterm Polar MILSATCOM System was a New Start.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 63.092 | 383.113 | 446.461 | 0.000 | 446.461 |
| Current President's Budget | 60.123 | 383.113 | 0.000 | 0.000 | 0.000 |
| Total Adjustments | -2.969 | 0.000 | -446.461 | 0.000 | -446.461 |
| • Congressional General Reductions | -0.891 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -2.078 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | -446.461 | 0.000 | -446.461 |

Change Summary Explanation

FY 2020: -\$446.461M transferred to PE 1206432F, Polar MILSATCOM (SPACE), Project 654215, EPS Recap.

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| Title: Payload | 60.123 | 333.667 | 0.000 |
| Description: Develop and acquire two EHF payloads, using AEHF's XDR waveform, for integration on host spacecraft. | | | |
| FY 2019 Plans: | | | |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | | R-1 Program Element (Number/Name) PE 1206434F <i>I Midterm Polar MILSATCOM System</i> | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| Continue development, production, and testing of the two payloads that were initiated in FY 2018. Conduct payload Critical Design Review. Develop interface documentation and integration plans with Space Norway. Continue program office support and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc. FY 2020 Plans: Effort has transitioned to PE 1206432F. FY 2019 to FY 2020 Increase/Decrease Statement: Decrease of \$333.667M due to PE 1206432F, Polar MILSATCOM (SPACE) transition. | | | | |
| Title: Ground Upgrades Description: Modify and upgrade the existing EPS CAPS to provide command and control and XDR mission planning capability for the two new payloads. FY 2019 Plans: Continue studies/risk reduction efforts on EPS CAPS Segment, issue Request For Proposal for tactical ground modifications, and award contract. FY 2020 Plans: Effort has transitioned to PE 1206432F. FY 2019 to FY 2020 Increase/Decrease Statement: Decrease of \$29.163M due to PE 1206432F, Polar MILSATCOM (SPACE) transition. | | 0.000 | 29.163 | 0.000 |
| Title: Gateway Upgrades Description: Modify and upgrade the existing EPS Gateway Segment to support the two new payloads. FY 2019 Plans: Continue studies/risk reduction efforts, and begin EPS Gateway Segment upgrades. Make preparations for installing a second telemetry and control terminal. Purchase additional telemetry and control terminals to recapitalize fleet that is becoming obsolete. FY 2020 Plans: Effort has transitioned to PE 1206432F. FY 2019 to FY 2020 Increase/Decrease Statement: Decrease of \$20.283M due to PE 1206432F, Polar MILSATCOM (SPACE) transition. | | 0.000 | 20.283 | 0.000 |
| Accomplishments/Planned Programs Subtotals | | 60.123 | 383.113 | 0.000 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 1206434F / <i>Midterm Polar MILSATCOM System</i> |
|--|---|

D. Other Program Funding Summary (\$ in Millions)

| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> <u>Base</u> | <u>FY 2020</u> <u>OCO</u> | <u>FY 2020</u> <u>Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To</u> <u>Complete</u> | <u>Total Cost</u> |
|--|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|
| • RDTE 05 PE 1206432F: <i>Polar MILSATCOM (Space)</i> | 32.536 | 27.337 | - | - | - | - | - | - | - | 0.000 | 59.873 |

Remarks

E. Acquisition Strategy

Award payloads contract to Northrop Grumman Aerospace Systems (NGAS) and initiate production of two EPS functional equivalent payloads in FY 2018. Conduct market research to identify industry capabilities and acquisition concepts. Award CAPS contract to Northrop Grumman Mission Systems (NGMS) for EPS ground upgrade. Gateway updates will be accomplished by Space and Naval Warfare Systems Command-Pacific, the EPS Gateway developer. The program office will initiate the procurement of a replacement terminal for the Telemetry and Command Terminal. This acquisition strategy updates the EPS Ground Segment to accommodate the EPS functional equivalent payloads and extend operations and sustainment beyond 2028. The U.S. Government will retain the system integrator role, as it was for EPS program of record.

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|---|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 1206434F / Midterm Polar MILSATCOM System | Project (Number/Name) 643720 / EPS Recapitalization |
|--|--|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| EPS-R Tactical Payloads 1-2 | SS/ Various | NGAS : Redondo Beach, CA | 6.000 | 60.100 | Feb 2018 | 295.768 | Oct 2018 | - | | - | | - | 0.000 | 361.868 | - |
| Control and Planning Segment Upgrades | TBD | NGMS : Redondo Beach, CA | 0.000 | - | | 25.851 | May 2019 | - | | - | | - | 0.000 | 25.851 | - |
| Gateway Upgrades | Various | Various : CA | 0.000 | - | | 17.979 | Dec 2018 | - | | - | | - | 0.000 | 17.979 | - |
| Technical Mission Analysis | MIPR | Aerospace : El Segundo, CA | 0.000 | - | | 6.256 | Nov 2018 | - | | - | | - | 0.000 | 6.256 | - |
| Enterprise SE&I | C/CPAF | LinQuest : Los Angeles, CA | 0.000 | - | | 27.384 | Nov 2018 | - | | - | | - | 0.000 | 27.384 | - |
| Subtotal | | | 6.000 | 60.100 | | 373.238 | | - | | - | | - | 0.000 | 439.338 | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| FFRDC | MIPR | Aerospace : El Segundo, CA | 0.000 | - | | 1.564 | Nov 2018 | - | | - | | - | 0.000 | 1.564 | - |
| A&AS | Various | Various : Various | 0.000 | - | | 8.151 | Nov 2018 | - | | - | | - | 0.000 | 8.151 | - |
| Other Support | Various | Various : Various | 0.000 | 0.023 | Feb 2018 | 0.160 | Oct 2018 | - | | - | | - | 0.000 | 0.183 | - |
| Subtotal | | | 0.000 | 0.023 | | 9.875 | | - | | - | | - | 0.000 | 9.898 | N/A |

| Project Cost Totals | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|--------------------|----------------|----------------|---------------------|--------------------|----------------------|-------------------------|-------------------|---------------------------------|
| | 6.000 | 60.123 | 383.113 | - | - | - | 0.000 | 449.236 | N/A |

Remarks

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 1206434F / <i>Midterm Polar MILSATCOM System</i> | Project (Number/Name) 643720 / <i>EPS Recapitalization</i> |

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| Payload | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Long Lead Parts | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Contract Initiation/Definitization | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Payload Segment Design/Build | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Preliminary Design Review (PDR) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| International Collaboration w/ Norway | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Critical Design Review (CDR) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ground and Gateway Upgrades/ Modifications | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Risk Reduction Activities/Studies | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Upgrades/Modifications | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Control and Planning Segment Upgrades, Contract Award | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 1206434F / <i>Midterm Polar MILSATCOM System</i> | Project (Number/Name) 643720 / <i>EPS Recapitalization</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|---|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Payload</i> | | | | |
| Long Lead Parts | 2 | 2018 | 4 | 2019 |
| Contract Initiation/Definitization | 2 | 2018 | 4 | 2018 |
| Payload Segment Design/Build | 2 | 2018 | 4 | 2019 |
| Preliminary Design Review (PDR) | 1 | 2019 | 1 | 2019 |
| International Collaboration w/ Norway | 2 | 2019 | 4 | 2019 |
| Critical Design Review (CDR) | 4 | 2019 | 4 | 2019 |
| <i>Ground and Gateway Upgrades/Modifications</i> | | | | |
| Risk Reduction Activities/Studies | 1 | 2019 | 4 | 2019 |
| Upgrades/Modifications | 1 | 2019 | 4 | 2019 |
| Control and Planning Segment Upgrades, Contract Award | 3 | 2019 | 3 | 2019 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 1206438F / <i>Space Control Technology</i> |
|--|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 44.139 | 91.646 | 64.231 | 0.000 | 64.231 | 75.200 | 77.539 | 100.995 | 51.963 | Continuing | Continuing |
| 642611: <i>Technology Insertion Planning and Analysis</i> | - | 44.139 | 91.646 | 64.231 | 0.000 | 64.231 | 75.200 | 77.539 | 100.995 | 51.963 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

Note
In FY 2020 and beyond, PE 1206438F, Space Control Technology, Project 642611, Technology Insertion Planning and Analysis, Experimentation Platforms efforts are transferred to PE 1206427F, Space Systems Prototype Transitions, Project 645601, in order to better align funding with related efforts.

A. Mission Description and Budget Item Justification

This project supports a range of activities including systems engineering, technology planning, development, demonstrations and prototyping, and testing, as well as modeling, simulations and exercises to support development and maturation of tactics and procedures for a responsive and resilient Space Control mission area. This includes technology development and prototyping for Defensive Counterspace (DCS) and Offensive Counterspace (OCS) and the necessary systems engineering for the warfighter to effectively employ such systems.

Specifically supported are DCS and Space Situational Awareness (SSA) activities which include developing threat warning payloads for monitoring, detecting, identifying, tracking, assessing, verifying, categorizing, and characterizing objects and events in space. Additionally, this activity supports the development of payload prototypes and space defense force packages for protecting U.S. space systems, resources, and operations from enemy attempts to negate, interfere, or destroy them.

Specific OCS activities include disruption, denial, or degradation (and associated Electronic Support) of adversary space systems which may be used for purposes hostile to U.S. national security interests. Rapid Reaction Capabilities in response to immediate warfighter needs in the Space Control mission area are developed within this program.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) is transforming the organization and implementation of space acquisition to an enterprise approach, maximizing innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose capabilities.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver SCT weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392F and 1206398F.

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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|--|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 1206438F / <i>Space Control Technology</i> |
|--|---|

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 7.842 | 92.118 | 82.252 | 0.000 | 82.252 |
| Current President's Budget | 44.139 | 91.646 | 64.231 | 0.000 | 64.231 |
| Total Adjustments | 36.297 | -0.472 | -18.021 | 0.000 | -18.021 |
| • Congressional General Reductions | 0.000 | -0.472 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 30.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -1.503 | 0.000 | | | |
| • Other Adjustments | 7.800 | 0.000 | -18.021 | 0.000 | -18.021 |

Change Summary Explanation

FY 2018: \$30.000M Congressional increase for Space Defense Force Packaging; \$7.8M OCO funding

FY 2020: \$18.021M decrease for Experimentation Platforms transfer to dedicated PE 1206427F, Space Systems Prototype Transitions.

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| Title: Rapid Reaction Branch | 15.642 | 25.656 | 21.612 |
| Description: Develops advanced capabilities for rapid prototyping and integration into space control programs of record and, if requested, to warfighter Urgent Operational Needs (UONs) and Joint Urgent Operational Needs (JUONs). Conducts prototyping, demonstration, testing, and rapid transition of technology and techniques to space control systems. | | | |
| FY 2019 Plans: Develop, test, and field enhancements for a fielded prototype-capability in USCENTCOM. Test and field second increment of operationalized prototype for USINDOPACOM. Field prototype capability to fulfill emergent USAFRICOM requirement. Develop and test enhancements to two prototypes that were transitioned to a program-of-record in FY 2017. Complete integration and test | | | |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | | R-1 Program Element (Number/Name) PE 1206438F / <i>Space Control Technology</i> | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| <p>of a technology prototype for a program-of-record. Continue program office support and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc.</p> <p>FY 2019 OCO supports pre-planned product improvements and version upgrades of advanced capabilities deployed to two locations in support of Operation Inherent Resolve</p> <p>FY 2020 Plans: Develop, test, train, field, transition and sustain advanced rapid reaction capabilities in response to emergent requirements from multiple Combatant Commands. Conduct initial technical development and integration activities against relevant threat systems and technologies in preparation for operational requirements. Develop and test advanced prototypes in support of activities within the Space Control Technology portfolio. Integrate and evaluate relevant GRA Increment 4 technologies. Integrate information assurance constructs and controls into developmental platforms to expedite fielding. Execute field development & test activities, at CONUS & OCONUS locations, to verify system performance in the operational environment. Enhance fielded rapid reaction capabilities in response to evolving threats and operator feedback. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 decreased compared to FY 2019 by \$4.044M. Justification for this decrease is described in the plans above.</p> | | | | |
| <p>Title: Experimentation Platforms & Defense Force Packaging</p> <p>Description: This effort will acquire, outfit and operate microsat busses with the primary purpose of demonstrating new technologies, flight testing payloads or subsystems, and validating Tactics, Techniques, and Procedures (TTPs) to ensure the delivery of critical space effects throughout all phases of a future space conflict against an adaptive and thinking adversary. It also supports a range of activities developing, prototyping, and fielding a family of on-board and near-board, modular resilience payloads supporting threat warning and protection options for National Security Space High-Value satellites. These payloads will be integrated with enterprise command and control capabilities for tasking, reporting, and response. On-orbit prototype demonstrations will be performed to demonstrate sensor/payload capabilities for high-value satellite force packaging requirements. Systems Engineering will enable the integration, interoperability and compatibility of new space control technology systems and capabilities amongst each other and amongst these new systems and the existing space control enterprise.</p> <p>FY 2019 Plans: Acquire two non-developmental microsat satellites to be flown on a Long Duration Propulsive ESPA platform, available Space Test Program mission or other ridesharing opportunity. Procure and/or integrate experimental payloads or sensors on microsat busses and/or operational assets. Plan and execute microsat on-orbit flight experiments; collect, process, distribute and analyze</p> | | 28.497 | 65.990 | 42.619 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | | R-1 Program Element (Number/Name) PE 1206438F / <i>Space Control Technology</i> | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| <p>payload/sensor data; and evaluate the military utility of coalition air, land, sea and space assets against known and projected threats/scenarios in order to prioritize current and future capability gaps and vulnerabilities.</p> <p>Initiate development of selected sensor/response payloads (from mod/sim and analysis efforts) for prototype demonstrations for threat warning and response payloads for high-value satellites. Initiate prototype and operations ground infrastructure design trades and build-out in support space control C2 and space range requirements. Perform risk reduction efforts to define high-value satellite bus requirements for force packaging on-ramps.</p> <p>Define enterprise interfaces and standards with System-of-Systems Model-Based Engineering, and modeling and simulation to determine critical paths and nodes, timing requirements, risks, and opportunities. Define developmental and operational test plans to ensure system performance in contested space and cyber domains. Continue program office support and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc.</p> <p>FY 2020 Plans: Continue development of selected sensor/response payloads (from mod/sim and analysis efforts) for prototype demonstrations for threat warning and response payloads for high-value satellites. Continue prototype and operations ground infrastructure design trades and build-out in support space control C2 and space range requirements. Perform risk reduction efforts to define high-value satellite bus requirements for force packaging on-ramps.</p> <p>Create and mature systems engineering models for space control scenarios and consolidate separate program artifacts into an interconnected virtual representation of the SY enterprise. Exercise those models to determine critical paths and nodes, timing requirements, risks, and opportunities.</p> <p>Define various systems engineering functions, tools, procedures, and best practices to accelerate acquisition of successful and affordable space systems. Perform systems engineering support tasks. Perform maturation and transition of new technology, and technology needs identification, prioritization, and solution development. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 decreased compared to FY 2019 by \$23.371M. Justification for this decrease is described in the plans above, including an \$18.021M transfer to PE 1206427F.</p> | | | | |
| Accomplishments/Planned Programs Subtotals | | 44.139 | 91.646 | 64.231 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force Date: February 2019

| Appropriation/Budget Activity | R-1 Program Element (Number/Name) |
|--|---|
| 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | PE 1206438F / <i>Space Control Technology</i> |

D. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

E. Acquisition Strategy

All contracts funded in this program element will be awarded using competitive procedures to the maximum extent possible. SCT program consists of numerous small projects. Space Defense Force Packaging and Experimentation Platforms initiative consists of several interrelated activities that require close coordination and integration, which may reduce the opportunities for independent competitive contracting actions.

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|--|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 1206438F / <i>Space Control Technology</i> | Project (Number/Name) 642611 / <i>Technology Insertion Planning and Analysis</i> |
|--|---|--|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| SCT Counterspace Technology Prototyping/ Rapid Reaction Development | Various | Various : Various | - | 6.605 | Jan 2018 | 22.888 | Jan 2019 | 20.092 | Oct 2019 | - | | 20.092 | Continuing | Continuing | - |
| SCT Technical Mission Analysis | RO | Aerospace : El Segundo, CA | - | 0.730 | Oct 2017 | - | | - | | - | | - | Continuing | Continuing | - |
| SCT Foundational Architecture | C/FFP | TBD : El Segundo, CA | - | - | | 8.804 | Feb 2019 | 8.319 | Oct 2019 | - | | 8.319 | Continuing | Continuing | - |
| SCT Experimentation Platforms Sensors | C/CPIF | Various : Various, CA | - | - | | 5.900 | Jan 2019 | - | | - | | - | Continuing | Continuing | - |
| SCT Experimentation Platforms Microsat Buses | C/FFP | Various : Various, CA | - | - | | 10.800 | Jan 2019 | - | | - | | - | Continuing | Continuing | - |
| SCT Modeling & Sim; Payload Analysis and Alternatives | C/Various | Various : Various, CA | - | 13.000 | Dec 2018 | 12.043 | May 2019 | 6.500 | Oct 2019 | - | | 6.500 | Continuing | Continuing | - |
| SCT OCO Funding P3I | Various | Various : Various | - | 7.800 | Jul 2018 | 1.100 | Jan 2019 | - | | - | | - | Continuing | Continuing | - |
| SCT Sensor Prototype Development | C/Various | Various : Various, CA | - | 15.497 | Jan 2019 | 23.320 | Feb 2019 | 24.300 | Oct 2019 | - | | 24.300 | Continuing | Continuing | - |
| SCT Ground Infrastructure | Various | Various : Various, CA | - | - | | 0.500 | Oct 2018 | 2.500 | Oct 2019 | - | | 2.500 | Continuing | Continuing | - |
| SCT High-Value Satellite Bus Requirements | Various | Various : Various, CA | - | - | | 1.500 | Feb 2019 | 1.000 | Oct 2019 | - | | 1.000 | Continuing | Continuing | - |
| Subtotal | | | - | 43.632 | | 86.855 | | 62.711 | | - | | 62.711 | Continuing | Continuing | N/A |

Remarks
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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|--|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 1206438F / <i>Space Control Technology</i> | Project (Number/Name) 642611 / <i>Technology Insertion Planning and Analysis</i> |
|--|---|--|

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|---|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Civilian Reimbursable Budget Authority | Various | Space and Missile Systems Center : El Segundo, CA | - | - | | 0.180 | Oct 2018 | - | | - | | - | Continuing | Continuing | - |
| Subtotal | | | - | - | | 0.180 | | - | | - | | - | Continuing | Continuing | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| A&AS | Various | Various : Various, CA | - | 0.507 | Jan 2018 | 3.311 | Feb 2019 | 1.520 | Jan 2020 | - | | 1.520 | Continuing | Continuing | - |
| FFRDC | Various | Various : Various, CA | - | - | | 1.000 | Oct 2018 | - | | - | | - | Continuing | Continuing | - |
| Other Support | Various | Various : Various, CA | - | - | | 0.300 | Oct 2018 | - | | - | | - | Continuing | Continuing | - |
| Subtotal | | | - | 0.507 | | 4.611 | | 1.520 | | - | | 1.520 | Continuing | Continuing | N/A |

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract | | |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|------------|-----|
| Project Cost Totals | | - | 44.139 | 91.646 | 64.231 | - | - | 64.231 | Continuing | Continuing | N/A |

Remarks

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 1206438F / <i>Space Control Technology</i> | Project (Number/Name) 642611 / <i>Technology Insertion Planning and Analysis</i> | |

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
|--|------------|
| RRB | |
| Rapid Prototyping | [Redacted] |
| Signal Processing Lab Gov't Reference Architecture (GRA) Dev Inc 3 | [Redacted] |
| Signal Processing Lab GRA (dev) Increment 4 | [Redacted] |
| Signal Processing Lab GRA (dev) Increment 5 | [Redacted] |
| Signal Processing Lab GRA (dev) Increment 6 | [Redacted] |
| Counterspace Systems Developmental Test (plan/execute/report) | [Redacted] |
| Capability Integration (Lab) | [Redacted] |
| Capability tests (execute/report) | [Redacted] |
| Ongoing capability DT planning/execution | [Redacted] |
| Experimentation Platforms & Defense Force Packaging | |
| Award SE&I Contract | [Redacted] |
| Enterprise Systems Engineering | [Redacted] |
| Microsat Satellite Bus Procurement | [Redacted] |
| Sensor Procurement | [Redacted] |
| Flight Experiments and Prototype Ops | [Redacted] |
| Military Utility Assessment | [Redacted] |
| Database of Architectural Elements | [Redacted] |
| Modeling & Simulation; Payload Analysis and Alternatives | [Redacted] |

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|--|
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 1206438F / <i>Space Control Technology</i> | Project (Number/Name) 642611 / <i>Technology Insertion Planning and Analysis</i> |
|--|---|--|

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|--|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

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|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Sensor Prototype Development | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ground Infrastructure | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SCT High-Value Satellite Bus Requirements Definition | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 1206438F / <i>Space Control Technology</i> | Project (Number/Name) 642611 / <i>Technology Insertion Planning and Analysis</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| RRB | | | | |
| Rapid Prototyping | 1 | 2018 | 4 | 2024 |
| Signal Processing Lab Gov't Reference Architecture (GRA) Dev Inc 3 | 1 | 2018 | 2 | 2019 |
| Signal Processing Lab GRA (dev) Increment 4 | 1 | 2019 | 4 | 2021 |
| Signal Processing Lab GRA (dev) Increment 5 | 3 | 2021 | 2 | 2024 |
| Signal Processing Lab GRA (dev) Increment 6 | 1 | 2024 | 4 | 2024 |
| Counterspace Systems Developmental Test (plan/execute/report) | 1 | 2018 | 3 | 2018 |
| Capability Integration (Lab) | 1 | 2018 | 4 | 2023 |
| Capability tests (execute/report) | 1 | 2018 | 4 | 2023 |
| Ongoing capability DT planning/execution | 1 | 2018 | 4 | 2023 |
| Experimentation Platforms & Defense Force Packaging | | | | |
| Award SE&I Contract | 2 | 2019 | 2 | 2019 |
| Enterprise Systems Engineering | 1 | 2020 | 4 | 2020 |
| Microsat Satellite Bus Procurement | 1 | 2019 | 1 | 2020 |
| Sensor Procurement | 1 | 2019 | 1 | 2020 |
| Flight Experiments and Prototype Ops | 2 | 2019 | 4 | 2020 |
| Military Utility Assessment | 1 | 2019 | 4 | 2020 |
| Database of Architectural Elements | 1 | 2019 | 4 | 2020 |
| Modeling & Simulation; Payload Analysis and Alternatives | 1 | 2019 | 4 | 2022 |
| Sensor Prototype Development | 2 | 2018 | 4 | 2021 |
| Ground Infrastructure | 2 | 2018 | 4 | 2022 |
| SCT High-Value Satellite Bus Requirements Definition | 2 | 2019 | 4 | 2021 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 1206730F / <i>Space Security and Defense Program</i> |
|--|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 41.385 | 45.542 | 56.385 | 0.000 | 56.385 | 56.414 | 68.759 | 79.703 | 80.686 | Continuing | Continuing |
| 64A025: <i>Space Protection Program</i> | - | 41.385 | 45.542 | 56.385 | 0.000 | 56.385 | 56.414 | 68.759 | 79.703 | 80.686 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

This Program Element funds the Department of Defense (DoD)/Air Force component of the Space Security and Defense Program (SSDP). The SSDP is a Joint DoD and Office of the Director of National Intelligence (ODNI) organization established to function as the center of excellence for options and strategies (materiel, non-materiel, cross-Title, cross-domain) leading to a more resilient and enduring National Security Space (NSS) Enterprise. The SSDP Operates under the authority of the Deputy Secretary of Defense (DEPSECDEF) and Principal Deputy Director of National Intelligence (PDDNI) to lead and collaborate on space protection vulnerability, susceptibility, and mitigation assessments of NSS services for the purpose of identifying, assessing, validating and introducing protection solutions into existing requirements, budgeting, acquisition, technology development and operational development processes. This unique mission provides an ongoing and crucial core protection competency that advances specific projects/activities (including non-kinetic techniques) to deliver comprehensive, economical and actionable solutions for both programmatic and operational domains.

The SSDP scope spans multiple space missions and stakeholders including the DoD, Intelligence Community (IC), civil, commercial, and international space entities that support NSS missions in both peacetime and throughout all phases of conflict. It is focused on being responsive to NSS stakeholders in providing technical and operational assessments of emergent threat concepts, and developing near-term and far-term plans to address strategies, threats, and vulnerabilities. Specific SSDP Projects are structured/designed to have an impact across all time horizons; near-term focused efforts to complicate adversary operations, mid-term focused efforts to improve system and enterprise survivability, and long-term focused efforts to render adversary capabilities ineffective.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) is transforming the organization and implementation of space acquisition to an enterprise approach, maximizing innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose capabilities.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver SSDP capability leading to a more resilient and enduring NSS enterprise. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392F and 1206398F.

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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|--|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 1206730F / <i>Space Security and Defense Program</i> |
|--|---|

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 41.385 | 45.542 | 46.453 | 0.000 | 46.453 |
| Current President's Budget | 41.385 | 45.542 | 56.385 | 0.000 | 56.385 |
| Total Adjustments | 0.000 | 0.000 | 9.932 | 0.000 | 9.932 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 9.932 | 0.000 | 9.932 |

Change Summary Explanation

FY2020: increase of \$9.932M for Adv Space Force Development

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| Title: Space Protection and Survivability | 41.385 | 45.542 | 56.385 |
| Description: SSDP organizes, plans, and executes specific projects in three focus areas: Enterprise Capabilities & Solutions; Mission Area Protection Concepts & Architectures; and Operational Tactics, Experiments & Prototypes. Enterprise Capabilities & Solutions projects focus on identifying and advocating for NSS enterprise-level protection requirements and architecture updates/modifications, informing/assisting policy-makers and analyzing policy to enhance the space protection posture across the NSS Enterprise. Mission Area Protection Concepts & Architectures projects constitute Protect and Defend (P&D) efforts focused on specific mission areas and/or systems. These projects entail the specific technical efforts, activities and engagements supporting capability and architecture development in mission areas such as Space Control, Command and Control (C2), Satellite Communication (SATCOM), Position-Navigation and Timing (PNT), Missile Warning (MW), Space Situational Awareness (SSA), Indications and Warning (I&W), and Intelligence - Surveillance - Reconnaissance (ISR). Finally, Operational Tactics, Experiments & Prototypes projects leverage operations expertise, experimentation and prototyping to improve operational capabilities and | | | |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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|--|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 1206730F / <i>Space Security and Defense Program</i> |
|--|---|

C. Accomplishments/Planned Programs (\$ in Millions)

develop, refine, document and demonstrate Tactics, Techniques and Procedures (TTPs), Concepts of Operation (CONOPS), and associated C2 functions. Some of these projects hold the potential to leave-behind residual operational prototypes/capabilities when partnered with the appropriate mission organization. Additionally, these projects will support development of TTPs and CONOPS for protection solutions developed by SSDP partners across the NSS Enterprise. Projects in all three areas will include non-kinetic solutions for protecting specific capabilities and the NSS Enterprise.

FY 2019 Plans:

FY2019 activities will rapidly engage and provide timely, validated solutions throughout the year to high-priority DOD & IC space initiatives and evolving NSS Enterprise needs while maintaining focus on planned projects to address evolving threat and protection priorities to advance the spectrum of space protection and defense solutions at both system and enterprise levels. The program will utilize in-depth technical analysis tailored modeling & simulation (M&S) and warfighter/operator engagement along with other means/methods as required to deliver actionable, timely and efficient protection solutions. This includes the use of expanded in-house analytical capabilities (tailored/adapted as necessary) and the fielding of high-fidelity M&S tools for additional space protection concepts, greater integration of physics-based tools into campaign-level models, and the employment of next-level analytical rigor essential for informing prototype selection and design to ensure the highest possible pay-off and mission impact. Specific to FY2019, Enterprise Capabilities & Solutions projects will utilize the broad and robust physics-based M&S, engineering-based analysis, and campaign/enterprise level rapid architecture analysis capabilities proved out during FY2018 to: 1) influence policy and guidance across the NSS enterprise and drive more resilient future architectures; 2) examine planned DoD & IC programs, experiments and demonstrations to provide program protection recommendations to preserve Blue capabilities; and 3) recommend architecture and policy solutions/changes to enable the necessary C2 and optimize the deployment of new capabilities to deliver critical warfighting effects. Finally, FY2019 Operational Tactics, Experiments & Prototypes projects will utilize in-house and mission-partner coordinated efforts to mature and shape CONOPS for programed and anticipated systems. These projects will seek to incorporate C2, SSA and Space Control concepts, planned capabilities and TTPs into relevant/targeted prototyping and experimentation activities. Projects in this area will incorporate objectives to demonstrate Title 10/50 space protection coordination, explore data fusion and, potentially, include the integration of commercial tools and services. Continued expansion of SSDP concept development & visualization tools and prototypes into/throughout FY2019 will provide the space C2 community toolsets to build, evaluate and select operational-level COAs (Courses of Actions). SSDP will execute FY2019 projects with our mission partners both in-house and, when appropriate, in their facilities to ensure the best application and use of toolsets, expertise and technology. These FY2019 projects will have the combined impact of continuing to mature and enhance the protection-oriented tools, policies, requirements and programs necessary to maintain and accelerate progress towards achieving resilience across the NSS community. Increased FY2019 funding delivers the means to move forward with maturing the program's analysis and M&S capabilities to provide the fidelity and depth of analytic competency necessary to support the efficient and informed design, development and prototyping of protection-based alternatives and solutions. In the face

| FY 2018 | FY 2019 | FY 2020 |
|---------|---------|---------|
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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 1206730F / <i>Space Security and Defense Program</i> |
|--|---|

| | | | |
|---|----------------|----------------|----------------|
| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|

| | | | |
|--|--|--|--|
| <p>of an increasingly complex and contested space environment this increased capacity and capability is central to national space protection efforts and is a critical advancement for staying abreast and ahead of both current and next-generation threats.</p> <p>FY 2020 Plans: FY2020 projects will further the integration of DoD & IC space protection efforts through technical engineering-based analysis, modeling & simulation (M&S), and operator engagement to deliver targeted analysis, policy recommendations, and initiatives across the full spectrum of the program's chartered activities. For FY2020 in support of Enterprise Capabilities & Solutions efforts the program will utilize Modeling, Simulation & Analysis (MS&A) tools to rapidly assess outcomes of integrated space and terrestrial scenarios for a variety of architectures to understand how protection options impact the outcome of a multi-domain scenario. Design and execute demonstrations and changes necessary for tactically relevant SSA. Integrate lower-cost, non-traditional data sources and determine their value for the protect and defend mission. Conduct engineering and physics based M&S to inform selection of on-orbit demonstrations and develop the mission plan and correlating test objectives for the selected demonstrations. Ensure activities track with National guidance on the proper protection for high profile next-generation, multi-mission, on-orbit experiments. Additionally, in support of the Mission Area Protection Concepts & Architectures focus area, the program will demonstrate the capability to analyze mission specific architectures for their resilience attributes. Develop a library of effective responses to adversary actions to speed decision making and improve response results for specific mission systems. As well as provide resilience recommendations to program offices, and enterprise/system requirements definition efforts in order to align resilience strategies with acquisition strategies. Finally, for Operational Tactics, Experiments & Prototypes projects the program will develop force packages for Combatant Commanders providing them a first-of-its-kind ability to employ multiple options across all phases of conflict vs. specific adversary capabilities. Leverage existing data-science software integration approaches to enable Operational Level Space C2 Course of Action (COA) planning and quantitative analysis of COA results, and demonstrate how this approach allows for quick prototyping of new tools, easy synchronization of existing tools, and risk reduction prior to transition of prototypes to programs of record. Build a learning environment to rapidly close C2 technology knowledge gaps, develop a multi-domain C2 prototype/test environment and identify/refine C2 performance metrics and standards. As well as develop Tactics, Techniques and Procedures (TTPs) to take full advantage of planned and programmed future capabilities along with the necessary technical detail to support their integration into Combatant Commander plans once fielded. In addition to these and other planned activities, the program will utilize in-depth technical analysis, tailored M&S and warfighter/operator engagement along with other means/methods to deliver actionable, timely and efficient protection solutions in response to emerging and time-sensitive high-priority DoD & IC space initiatives and evolving NSS Enterprise needs. These activities will frequently be executed with our mission partners, either in-house or in their facilities, to ensure the best application and use of toolsets, expertise and technology.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p> | | | |
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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 1206730F / <i>Space Security and Defense Program</i> |
|--|---|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| FY2020 increased compared to FY2019 by \$9.932M due to funding of Adv Space Force Development and \$911K for development of TTPs. | | | |
| Accomplishments/Planned Programs Subtotals | 41.385 | 45.542 | 56.385 |

D. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

E. Acquisition Strategy

All contracts funded in this program element will be awarded using competitive procedures to the maximum extent possible. The program consists of numerous small projects.

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 1206730F / Space Security and Defense Program | Project (Number/Name) 64A025 / Space Protection Program |
|--|--|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Space Protection and Survivability | Various | Various : Various | - | 37.057 | Nov 2017 | 40.240 | Nov 2018 | 50.893 | Nov 2019 | - | | 50.893 | Continuing | Continuing | - |
| Subtotal | | | - | 37.057 | | 40.240 | | 50.893 | | - | | 50.893 | Continuing | Continuing | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Program Support and Infrastructure (Gov't PMA) | Various | Various : Various | - | 1.587 | Nov 2017 | 1.738 | Nov 2018 | 1.589 | Nov 2019 | - | | 1.589 | Continuing | Continuing | - |
| Oversight, Advisory and other Technical Support (Contractor PMA) | Various | Various : Various | - | 2.741 | Nov 2017 | 3.564 | Nov 2018 | 3.903 | Nov 2019 | - | | 3.903 | Continuing | Continuing | - |
| Subtotal | | | - | 4.328 | | 5.302 | | 5.492 | | - | | 5.492 | Continuing | Continuing | N/A |

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract | | |
|--|----------------------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|------------|------------|
| | Project Cost Totals | | - | 41.385 | 45.542 | 56.385 | - | - | 56.385 | Continuing | Continuing |

Remarks

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 1206730F / <i>Space Security and Defense Program</i> | Project (Number/Name) 64A025 / <i>Space Protection Program</i> |

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
|--|--|
| <i>Space Protection and Survivability</i> | |
| Enterprise Capabilities Solutions | |
| Mission Area Protection Concepts and Architectures | |
| Operational Tactics, Experiments and Prototypes | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 1206730F / <i>Space Security and Defense Program</i> | Project (Number/Name) 64A025 / <i>Space Protection Program</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Space Protection and Survivability</i> | | | | |
| Enterprise Capabilities Solutions | 1 | 2018 | 4 | 2024 |
| Mission Area Protection Concepts and Architectures | 1 | 2018 | 4 | 2024 |
| Operational Tactics, Experiments and Prototypes | 1 | 2018 | 4 | 2024 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 1206760F / <i>Protected Tactical Enterprise Service (PTES)</i> |
|--|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 17.552 | 46.419 | 105.003 | 0.000 | 105.003 | 123.841 | 112.720 | 56.806 | 57.828 | Continuing | Continuing |
| 643726: <i>PTES</i> | - | 17.552 | 46.419 | 105.003 | 0.000 | 105.003 | 123.841 | 112.720 | 56.806 | 57.828 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

The global threat of electronic warfare attacks against space systems will expand in the coming years in both number and types of weapons. Threat development will very likely focus on jamming capabilities against dedicated military satellite communications (MILSATCOM). To address this critical need, the Air Force is developing the Protected Tactical Enterprise Service (PTES) ground system to provide worldwide, anti-jam, Low Probability of Intercept (LPI) communications for tactical warfighters. PTES will utilize the Protected Tactical Waveform (PTW) to provide anti-jam communications via military and commercial satellite systems for tactical users in all Services. Initially, PTES will utilize the Wideband Global SATCOM (WGS) system and be expanded later to include commercial satellites and the Protected Tactical SATCOM (PTS) system.

The PTES program is developing a mission management system (MMS), a key management system (KMS) and hub system to enable PTW via transponded WGS satellites, with future extension to commercial SATCOM. Production-representative PTW modems for user terminals are being developed by the Protected Tactical Service Field Demonstration (PTSFD) and will be separately acquired by each Service and by international partners.

To meet the warfighter requirements for protected tactical MILSATCOM and the capability gaps identified in these studies, RDT&E funding is required for architectural development, acquisition strategy development, system requirements and system trades analysis, and engineering, manufacturing, developing, testing and evaluating PTES systems and segments.

The PTES rapid prototype addresses an urgent operational need in the Pacific region by achieving Initial Operational Capability (IOC) in 2023. IOC provides ground elements for PTW over WGS and consists of PTES installation at two WGS Gateway sites utilizing one WGS satellite. The Navy Wideband Anti-Jam Modem System (WAMS) relies on PTES to provide PTW ground infrastructure. The Air Force is utilizing FY 2016 National Defense Authorization Act, Section 804, Middle Tier of Acquisition for Rapid Prototyping authority to deliver a PTES Early Operations Capability meeting the Navy's Minimum Viable Product in 2022. At Full Operational Capability (FOC) PTES will provide worldwide PTW operations using up to all WGS satellites.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) is transforming the organization and implementation of space acquisition to an enterprise approach, maximizing innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose capabilities.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 1206760F / <i>Protected Tactical Enterprise Service (PTES)</i> |
|--|---|

This program element may include necessary civilian pay expenses required to manage, execute, and deliver PTES weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392F and 1206398F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 18.150 | 51.419 | 105.003 | 0.000 | 105.003 |
| Current President's Budget | 17.552 | 46.419 | 105.003 | 0.000 | 105.003 |
| Total Adjustments | -0.598 | -5.000 | 0.000 | 0.000 | 0.000 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | -5.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -0.598 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Change Summary Explanation

FY 2019: -\$5.000M Congressional Directed Reduction due to schedule slip.

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| Title: Acquisition Strategy Development | 15.307 | 0.000 | 0.000 |
| Description: The Joint Space Communications Layer Initial Capabilities Document and the Protected Satellite Communications Services Analysis of Alternatives defined the need for a more resilient, protected tactical architecture with increased capacity and bandwidth. In accordance with these requirements, the PTES program will develop an acquisition strategy to meet the required capabilities within an acceptable cost and schedule. | | | |
| FY 2019 Plans: | | | |

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|---|--|---|----------------|----------------|
| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | | R-1 Program Element (Number/Name) PE 1206760F I <i>Protected Tactical Enterprise Service (PTES)</i> | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| N/A. FY 2020 Plans: N/A FY 2019 to FY 2020 Increase/Decrease Statement: N/A | | | | |
| Title: Source Selection & Contract Award Description: Competitively award a single contract to develop and field PTES, including declaration of IOC and FOC. The contractor will be responsible for developing all PTES segments and performing all system integration, including end-to-end tests of the complete PTES system. FY 2019 Plans: N/A. FY 2020 Plans: N/A FY 2019 to FY 2020 Increase/Decrease Statement: N/A | | 2.245 | 0.000 | 0.000 |
| Title: PTES Prototype Development Description: This major thrust was formerly known as PTES System Development. After competitive contract award, the PTES team will develop a prototype consisting of three segments: a MMS, a KMS, and Joint Hubs integrated into existing SATCOM gateways. PTES will enable an anti-jam communications capability via PTW over WGS for tactical users in all Services and International Partners. The PTES team will be responsible for developing all PTES segments and performing all system integration, including end-to-end tests of the complete PTES prototype. FY 2019 Plans: Award and execute the PTES contract. Purchase and provide Government Furnished Equipment to PTES Contractor. Evaluate results of Protected Tactical Service Field Demonstration (PTSFD) testing and incorporate lessons learned. Continue program office support and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc. FY 2020 Plans: | | 0.000 | 46.419 | 105.003 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | | R-1 Program Element (Number/Name) PE 1206760F / <i>Protected Tactical Enterprise Service (PTES)</i> | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| Continue PTES Prototype Development. Plan, develop, test and deliver the MMS, KMS, and Key Loading Initialization Facility (KLIF) Build 1 software for Government PTES Program Office testing on the Defense Information System Agency (DISA) Core Data Center environment. Conduct Risk Reduction Demonstration and Risk Reduction Test for Build 1. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc. | | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: FY2020 increased compared to FY2019 by \$58.584M. Justification for this increase is described in plans above. | | | | |
| Accomplishments/Planned Programs Subtotals | | 17.552 | 46.419 | 105.003 |
| D. Other Program Funding Summary (\$ in Millions) N/A | | | | |
| Remarks Associated WAMS funding is contained within Navy Multiband Terminal (NMT) program. | | | | |
| E. Acquisition Strategy PTES was designated as a rapid prototype in June 2018 under section 804 of the National Defense Authorization Act for Fiscal Year 2016 (Public Law 114-92). The objective of the PTES ground system is to provide an operational anti-jam communications capability via WGS using PTW. The PTES acquisition approach is to competitively award a single contract to develop and field PTES, through declaration of IOC. The contractor will be responsible for developing all PTES segments (MMS, KMS, and Hub) and performing all system integration, including end-to-end tests of the complete PTES prototype. The 45th Test Squadron is planned to be the PTES Developmental Test organization and AFOTEC is planned to be the Operational Test organization. | | | | |
| F. Performance Metrics Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission. | | | | |

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 1206760F / <i>Protected Tactical Enterprise Service (PTES)</i> | Project (Number/Name) 643726 / <i>PTES</i> |
|--|---|--|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Protected Tactical Enterprise Service Prototype Development | C/CPIF | Boeing : El Segundo, CA | - | 2.495 | Nov 2018 | 20.159 | Nov 2018 | 72.527 | Oct 2019 | - | | 72.527 | Continuing | Continuing | - |
| Core Data Center | MIPR | DISA : Pensacola, FL | - | 0.820 | Jan 2018 | 4.000 | Dec 2018 | 4.000 | Oct 2019 | - | | 4.000 | Continuing | Continuing | - |
| Technical Mission Analysis | MIPR | Aerospace : El Segundo, CA | - | 2.966 | Jan 2018 | 4.497 | Dec 2018 | 4.296 | Oct 2019 | - | | 4.296 | Continuing | Continuing | - |
| Enterprise SE&I | Various | Various : Various | - | 7.315 | Jan 2018 | 8.402 | Dec 2018 | 9.928 | Oct 2019 | - | | 9.928 | Continuing | Continuing | - |
| Subtotal | | | - | 13.596 | | 37.058 | | 90.751 | | - | | 90.751 | Continuing | Continuing | N/A |

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Test Planning & Execution DT/OT | Various | Various : Various | - | 0.294 | Jan 2018 | 2.167 | Dec 2018 | 2.720 | Oct 2019 | - | | 2.720 | Continuing | Continuing | - |
| Subtotal | | | - | 0.294 | | 2.167 | | 2.720 | | - | | 2.720 | Continuing | Continuing | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| FFRDC | MIPR | Aerospace : El Segundo, CA | - | 1.576 | Jan 2018 | 2.421 | Dec 2018 | 2.417 | Oct 2019 | - | | 2.417 | Continuing | Continuing | - |
| A&AS | Various | Various : Various | - | 2.014 | Jan 2018 | 4.573 | Dec 2018 | 8.915 | Oct 2019 | - | | 8.915 | Continuing | Continuing | - |
| Other Support | Various | Various : Various | - | 0.072 | Jan 2018 | 0.200 | Oct 2018 | 0.200 | Oct 2019 | - | | 0.200 | Continuing | Continuing | - |
| Subtotal | | | - | 3.662 | | 7.194 | | 11.532 | | - | | 11.532 | Continuing | Continuing | N/A |

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|--|--------------------|----------------|----------------|---|--------------------|----------------------|-------------------------|---|---------------------------------|--|--|
| Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force | | | | | | | | Date: February 2019 | | | |
| Appropriation/Budget Activity 3600 / 4 | | | | R-1 Program Element (Number/Name) PE 1206760F / <i>Protected Tactical Enterprise Service (PTES)</i> | | | | Project (Number/Name) 643726 / PTES | | | |
| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract | | |
| Project Cost Totals | - | 17.552 | 46.419 | 105.003 | - | 105.003 | Continuing | Continuing | N/A | | |

Remarks

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 1206760F / <i>Protected Tactical Enterprise Service (PTES)</i> | Project (Number/Name) 643726 / PTES |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| PTES | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Conduct Source Selection | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Award Development Contract | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PTES Prototype Development | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Software Build 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Software Build 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Software Build 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Early Ops Capability (Navy Minimum Viable Product) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Software Build 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Software Build 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IOC | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Software Build 6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Software Build 7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Developmental/Operational Testing (to include Planning) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 1206760F / <i>Protected Tactical Enterprise Service (PTES)</i> | Project (Number/Name) 643726 / <i>PTES</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|---|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| PTES | | | | |
| Conduct Source Selection | 2 | 2018 | 1 | 2019 |
| Award Development Contract | 1 | 2019 | 1 | 2019 |
| PTES Prototype Development | 1 | 2019 | 4 | 2024 |
| Software Build 1 | 4 | 2019 | 3 | 2020 |
| Software Build 2 | 3 | 2020 | 2 | 2021 |
| Software Build 3 | 2 | 2021 | 1 | 2022 |
| Early Ops Capability (Navy Minimum Viable Product) | 1 | 2022 | 1 | 2022 |
| Software Build 4 | 1 | 2022 | 4 | 2022 |
| Software Build 5 | 4 | 2022 | 3 | 2023 |
| IOC | 3 | 2023 | 3 | 2023 |
| Software Build 6 | 3 | 2023 | 2 | 2024 |
| Software Build 7 | 2 | 2024 | 4 | 2024 |
| Developmental/Operational Testing (to include Planning) | 1 | 2018 | 4 | 2024 |

Note

FOC occurs outside FYDP

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 1206761F / <i>Protected Tactical Service (PTS)</i> |
|--|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|--|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 23.404 | 29.626 | 173.694 | 0.000 | 173.694 | 253.392 | 263.096 | 461.058 | 842.500 | Continuing | Continuing |
| 643728: <i>Protected Tactical SATCOM</i> | - | 23.404 | 29.626 | 173.694 | 0.000 | 173.694 | 253.392 | 263.096 | 461.058 | 842.500 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

The global threat of electronic warfare attacks against space systems will expand in the coming years in both number and types of weapons. Threat development will very likely focus on jamming capabilities against dedicated military satellite communications. To address this critical need, the Air Force is developing the Protected Anti-jam Tactical Satellite Communications (PATs) family-of-systems, of which the Protected Tactical Satellite Communications (PTS) program was a New Start in FY 2018 to fulfill the highest level of anti-jam capabilities to mitigate adversarial jamming effects. PTS provides worldwide and polar, beyond-line-of-sight, Anti-Jam (AJ), low-probability-of intercept communications in benign and highly-contested environments utilizing the Protected Tactical Waveform (PTW). PTS, with its on-board payload processing and antenna design, enables reliable tactical satellite communications within close proximities to adversarial jammers. The system also employs interfaces consistent with Air Force Space Command's on-going resilience initiatives and Enterprise Ground Services (EGS); thereby enhancing mission assurance, resiliency, and interoperability.

The Air Force is utilizing FY 2016 National Defense Authorization Act, Section 804, Middle Tier of Acquisition for Rapid Prototyping authority and Section 815, Other Transaction Authority (OTA), to achieve an affordable, rapid, operational capability for the tactical warfighter. This strategy employs spiral payload development to progressively and incrementally deploy prototypes with residual capabilities demonstrated in an operational environment. These spiral payload prototypes demonstrate innovative anti-jam technologies with modular and scalable payloads to meet validated military needs for protected tactical communications. This includes technical baseline development, systems engineering trade analyses, internal/external system integration and development, candidate system architecture evaluations, risk reduction demonstrations, prototyping concepts development, system testing, and enabling technologies maturation.

PTS includes a space segment, ground segment and gateway segment. For the space segment, the Air Force strategy utilizes a payload-centric focus to enable an affordable, resilient space architecture. This enables hosting and rideshare opportunities with other US government, commercial, International Partner satellites or integration onto a commodity satellite bus. For the ground segment, PTS leverages the EGS for satellite command and control, and the Protected Tactical Enterprise Service (PTES) rapid prototyping activity for mission and key management planning. The PTS gateway segment enables tactical warfighters reach back to global DoD Information Network. The PTS user terminal segment, not included in this PTS acquisition, will be procured by the military Services utilizing low-cost PTW modem upgrades enabled by the Protected Tactical Service Field Demonstration technology demonstration program.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) is transforming the organization and implementation of space acquisition to an enterprise approach, maximizing innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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|--|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 1206761F / <i>Protected Tactical Service (PTS)</i> |
|--|---|

authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose capabilities.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver PTS weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392F and 1206398F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 24.201 | 29.776 | 173.694 | 0.000 | 173.694 |
| Current President's Budget | 23.404 | 29.626 | 173.694 | 0.000 | 173.694 |
| Total Adjustments | -0.797 | -0.150 | 0.000 | 0.000 | 0.000 |
| • Congressional General Reductions | 0.000 | -0.150 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -0.797 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Change Summary Explanation

In the FY 2019 budget, PTS received a Congressional rescission of \$5.000 million. The correct total for FY 2018 is \$18.404 million.

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| Title: Acquisition Strategy Development & Source Selection | 7.896 | 6.315 | 1.927 |
| Description: Develop and refine the PTS acquisition strategy for rapid prototyping and fielding of hostable payloads with rideshare opportunities, free-flyer satellite bus configurations, and other potential solutions. This includes developing the request for prototype proposals to enable competitive selection of up to four payload prime contractors. In parallel to preparing for the | | | |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | | R-1 Program Element (Number/Name) PE 1206761F / <i>Protected Tactical Service (PTS)</i> | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| competitive selection, the Air Force is developing strategies for the acquisition of commodity buses, ground segment software and hardware, gateway segment terminals and equipment, risk reduction projects, and other supporting activities. | | | | |
| <p>FY 2019 Plans: Continue to develop documentation necessary to support rapid prototyping activities. Complete acquisition strategy approval. Release a prototype proposal to industry. Begin source selection for a competitive rapid prototyping effort with multiple vendors.</p> <p>FY 2020 Plans: Complete source selection for PTS rapid prototyping efforts. Competitively award rapid prototyping contracts for hosted payloads to up to four contractors. Develop and mature strategies for the acquisition of a bus or host provider, gateway terminals, and ground segment.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY2020 decreased compared to FY 2019 by \$4.388M. Justification for this decrease is described in plans above.</p> | | | | |
| <p>Title: Technical Baseline Management and Risk Reduction</p> <p>Description: This major thrust was formerly known as Technical Baseline and Architectural Engineering. Mature technical baseline and interface requirements. Conduct architectural engineering, risk reduction, prototype concept development, and associated system engineering trades required for the PTS space, ground, and gateway segments. Refine technical baseline, interface requirements, and concept of operations during rapid prototyping and fielding.</p> <p>FY 2019 Plans: Continue studies for constellation architectural design. Continue to develop and mature system requirements. Continue analyses on system design/trade-offs and affordability trades. Continue to develop technical baseline products, including system engineering and integration plans. Leverage Other Transaction Agreements (OTAs) such as the Space Enterprise Consortium (SpEC) to release a request for proposal and award a contract for the End-Cryptographic Unit (ECU). Prepare for award and execution of Rapid Prototyping Phase. Continue program office support and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc.</p> <p>FY 2020 Plans: Mature interface requirements for PTS space, ground, and gateway segments. Continue maturation and refinement of the technical baseline, system architecture, systems engineering trades and analyses. Continue risk reduction activities, prototype concept development, and initiate design and development of key system components such as the End-Cryptographic Unit (ECU).</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p> | | 15.508 | 23.311 | 46.044 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | | R-1 Program Element (Number/Name) PE 1206761F / <i>Protected Tactical Service (PTS)</i> | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| FY 2020 increased compared to FY 2019 by \$22.733M. Justification for this increase is described in plans above. | | | | |
| Title: PTS Rapid Prototype Design and Development | | 0.000 | 0.000 | 125.723 |
| Description: Previously included in the Technical Baseline and Architectural Engineering major thrust. Rapid prototyping of PTS space, ground, and gateway segments and key system components. Develop, demonstrate, test, and evaluate PTS hardware and software systems. Design and develop modular, scalable payloads to support hosted or free-flyer configurations. Demonstrate prototype payload performance on-orbit. Evaluate PTS concept of operations with user participation and enable potential residual operational capability. Continues the prototyping and risk reduction efforts as previously described under FY 2019 President's Budget "Technical Baseline and Architectural Engineering major thrust." | | | | |
| FY 2019 Plans: PTS Rapid Prototype Design and Development effort was previously included in the "Technical Baseline and Architectural Engineering" major thrust. | | | | |
| FY 2020 Plans: Award up to four competitive prototyping contracts or agreements to ensure robust competition from SATCOM providers for the rapid prototyping of the PTS System. Work with up to four contractors to begin prototype of the PTS Space Segment. Conduct design work and reviews in support of prototype development. Begin system software development. Develop engineering design models. Develop and purchase hardware to support demonstration of early prototype deliveries. Conduct sub-system prototyping such as antenna suites and space processor. Model system architectures and conduct trade studies. Develop and mature system requirements, test plans, and integration plans. Initiate planning and design of Space Segment interfaces between the Ground and Gateway Segments of the PTS System. Begin development of Ground and Gateway Segments. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc. | | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 increased compared to FY 2019 by \$125.723M. Justification for this increase is described in plans above. | | | | |
| Accomplishments/Planned Programs Subtotals | | 23.404 | 29.626 | 173.694 |
| D. Other Program Funding Summary (\$ in Millions) | | | | |
| N/A | | | | |
| Remarks | | | | |
| In the FY 2019 budget, PTS received a Congressional rescission of \$5.000 million. The correct total for FY 2018 is \$18.404 million. | | | | |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force Date: February 2019

| Appropriation/Budget Activity | R-1 Program Element (Number/Name) |
|--|---|
| 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | PE 1206761F / <i>Protected Tactical Service (PTS)</i> |

E. Acquisition Strategy

The PTS team utilizes the FY 2016 National Defense Authorization Act Section 804 guidance for Rapid Prototyping/Rapid Fielding and Section 815 OTA guidance in developing the acquisition strategy. This strategy places an emphasis on the rapid prototyping, production, and incremental iteration of PTS capability. This strategy takes the form of a series of successively honed and tailored Spirals, focusing on payload development and hosting opportunities and incorporating lessons learned from Milstar, Enhanced Polar System (EPS), EPS-Recapitalization, Advanced Extremely High Frequency, PTES, and commercial SATCOM practices.

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 1206761F / <i>Protected Tactical Service (PTS)</i> | Project (Number/Name) 643728 / <i>Protected Tactical SATCOM</i> |
|--|---|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Risk Reduction and Concept Development Prototyping | C/Various | Various : Various | - | 5.921 | Jan 2018 | - | | - | | - | | - | 0.000 | 5.921 | - |
| Space Hub End Cryptographic Unit (ECU) | C/TBD | Various : Various | - | 0.000 | | 10.932 | Jun 2019 | 25.685 | Jan 2020 | - | | 25.685 | Continuing | Continuing | - |
| Protected Tactical SATCOM Rapid Prototyping (up to four contractors) | C/TBD | Various : Various | - | - | | - | | 111.828 | Jan 2020 | - | | 111.828 | Continuing | Continuing | - |
| Technical Mission Analysis | MIPR | Aerospace : El Segundo, CA | - | 3.955 | Jan 2018 | 3.727 | Nov 2018 | 6.759 | Nov 2019 | - | | 6.759 | Continuing | Continuing | - |
| Enterprise SE&I | Various | Various : Various | - | 6.291 | Jan 2018 | 10.116 | Jan 2019 | 13.600 | Jan 2020 | - | | 13.600 | Continuing | Continuing | - |
| FY 2018 Congressional rescission | Various | Not specified. : TBD | - | 5.000 | | - | | - | | - | | - | 0.000 | 5.000 | - |
| Subtotal | | | - | 21.167 | | 24.775 | | 157.872 | | - | | 157.872 | Continuing | Continuing | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| FFRDC | MIPR | Aerospace : El Segundo, CA | - | 1.695 | Jan 2018 | 1.367 | Nov 2018 | 1.267 | Nov 2019 | - | | 1.267 | Continuing | Continuing | - |
| Other Support | Various | Various : Various | - | 0.050 | Jan 2018 | 0.050 | Nov 2018 | 0.100 | Nov 2019 | - | | 0.100 | Continuing | Continuing | - |
| A&AS | Various | Various : Various | - | 0.492 | Jan 2018 | 3.434 | Jan 2019 | 14.455 | Nov 2019 | - | | 14.455 | Continuing | Continuing | - |
| Subtotal | | | - | 2.237 | | 4.851 | | 15.822 | | - | | 15.822 | Continuing | Continuing | N/A |

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract | | |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|------------|-----|
| Project Cost Totals | | - | 23.404 | 29.626 | 173.694 | - | | 173.694 | Continuing | Continuing | N/A |

Remarks

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 1206761F / <i>Protected Tactical Service (PTS)</i> | Project (Number/Name) 643728 / <i>Protected Tactical SATCOM</i> |

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

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| Hostable Protected Tactical PL | |
| Technical Baseline Management and Risk Reduction | |
| Acquisition Strategy Development and Source Selection | |
| Risk Reduction and Prototyping Concept Development (Includes SpEC OT) | |
| Acquisition Strategy Approval (Air Force Review Board) | |
| Space Hub End Cryptographic Unit (ECU) | |
| Rapid Prototyping Spiral Contract/Agreement Award (up to four contractors) | |
| Rapid Prototyping Spiral PTS System Prototype Design & Development | |
| Development Spiral Decision (Air Force Review Board) | |
| Development Spiral ATP | |
| Development Spiral PTS System Prototype Design & Development | |
| PTS Prototype Payload Available for Launch | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 1206761F / <i>Protected Tactical Service (PTS)</i> | Project (Number/Name) 643728 / <i>Protected Tactical SATCOM</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Hostable Protected Tactical PL</i> | | | | |
| Technical Baseline Management and Risk Reduction | 1 | 2018 | 4 | 2024 |
| Acquisition Strategy Development and Source Selection | 1 | 2018 | 2 | 2020 |
| Risk Reduction and Prototyping Concept Development (Includes SpEC OT) | 3 | 2018 | 2 | 2020 |
| Acquisition Strategy Approval (Air Force Review Board) | 1 | 2019 | 1 | 2019 |
| Space Hub End Cryptographic Unit (ECU) | 3 | 2019 | 3 | 2022 |
| Rapid Prototyping Spiral Contract/Agreement Award (up to four contractors) | 2 | 2020 | 2 | 2020 |
| Rapid Prototyping Spiral PTS System Prototype Design & Development | 2 | 2020 | 4 | 2023 |
| Development Spiral Decision (Air Force Review Board) | 2 | 2022 | 2 | 2022 |
| Development Spiral ATP | 4 | 2022 | 4 | 2022 |
| Development Spiral PTS System Prototype Design & Development | 4 | 2022 | 4 | 2024 |
| PTS Prototype Payload Available for Launch | 4 | 2024 | 4 | 2024 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 1206855F / <i>Evolved Strategic SATCOM (ESS)</i> |
|--|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 15.473 | 29.229 | 172.206 | 0.000 | 172.206 | 206.247 | 301.617 | 537.124 | 915.900 | Continuing | Continuing |
| 643725: <i>Evolved Strategic SATCOM (ESS)</i> | - | 15.473 | 29.229 | 172.206 | 0.000 | 172.206 | 206.247 | 301.617 | 537.124 | 915.900 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

Note

PE 1206855F, Evolved Strategic SATCOM (ESS), changed from Protected SATCOM Services (PSCS) - Aggregated.

A. Mission Description and Budget Item Justification

The ESS system continues the strategic SATCOM mission of the Advanced Extremely High Frequency (AEHF) program by providing space and mission control segments for worldwide and arctic DoD strategic, secure, jam-resistant, nuclear-survivable communications for ground, sea, and air assets. ESS will meet the requirements for strategic communications and capability gaps identified in the Protected Satellite Communications Services (PSCS) Analysis of Alternatives (AoA), the Protected Follow-on for Resiliency (PAFR) Study and the Strategic Tiger Team. The ESS architecture and functionality will be designed in accordance with the United States Strategic Command's signed ESS Concept of Operations and the Joint Requirements Oversight Council's validated Capability Development Document (CDD) satisfying the legacy AEHF strategic requirements and mission performance with enhancements for increased resiliency and cybersecurity.

ESS will support strategic mission requirements such as Presidential and National Voice Conferencing (PNVC), Nuclear Command and Control (NC2) strategic networks, terminal report back, and Emergency Action Message (EAM) dissemination. The program will provide the National Command Authority (NCA) and Combatant Commanders with highly-reliable, secure Military Satellite Communications (MILSATCOM) to execute the Single Integrated Operational Plan (SIOP), and command and control strategic forces at all levels of conflict. ESS will support the forecasted 2030 strategic demand in all operational environments (nuclear, contested, and benign) and will be compatible with the eXtended Data Rate (XDR) waveform. The ESS system will also satisfy emerging requirements and capabilities for enhanced resilience by accommodating on-board resilience payload(s) and incorporating improved resiliency and cybersecurity features.

For more rapid and resilient strategic capability risk reduction, the ESS Program Office is developing an acquisition strategy that leverages Section 804 of the National Defense Authorization Act of 2016 for rapid prototyping and rapid fielding to the greatest extent practical, while maintaining the continuity of the AEHF strategic mission that interfaces operationally within the existing Nuclear, Command, Control, and Communications (NC3) architecture.

Activities for the ESS ground segment acquisition includes evolving and enhancing existing ground segment, space-to-ground segment integration, and modernization in support of Enterprise Ground Services compatibility, in accordance with the approved acquisition strategy and schedule.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) is transforming the organization and implementation of space acquisition to an enterprise approach, maximizing innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 1206855F / <i>Evolved Strategic SATCOM (ESS)</i> |
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authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose capabilities.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver ESS weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392F and 1206398F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 16.000 | 29.379 | 172.206 | 0.000 | 172.206 |
| Current President's Budget | 15.473 | 29.229 | 172.206 | 0.000 | 172.206 |
| Total Adjustments | -0.527 | -0.150 | 0.000 | 0.000 | 0.000 |
| • Congressional General Reductions | 0.000 | -0.150 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -0.527 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Change Summary Explanation

In the FY 2019 budget, ESS received a Congressional rescission of \$12.000 million. The correct total for FY 2018 is \$3.473 million.

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| Title: Technical Baseline and Architectural Engineering | 10.006 | 17.537 | 0.000 |
| Description: The PSCS AoA, PAFR study, and Space Enterprise Vision study further defined the need for a more resilient, protected space architecture. ESS will support 2030 strategic demand in all operational environments (nuclear, contested, and benign). Develop the technical baseline and conduct architectural engineering. Protected Tactical Waveform accommodation is not included in the current ESS CDD. | | | |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 1206855F / <i>Evolved Strategic SATCOM (ESS)</i> |
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|---|----------------|----------------|----------------|
| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|

| | | | |
|--|--|--|--|
| <p>FY 2019 Plans: Finalize system requirements and the CDD to include focus on risk reduction studies. Continue analyses on system design/ trade-offs and affordability trades. Continue the development of technical baseline products, and other documents and product requirements, system engineering and integration plans, launch and early-orbit test plans, operational test and evaluation plans required for concept development and future efforts. Continue program office and other related support activities that may include, but are not limited to studies, technical analysis, etc.</p> <p>FY 2020 Plans: N/A</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 decreased compared to FY 2019 by \$17.537M. Justification for the decrease is described in plans above.</p> | | | |
|--|--|--|--|

| | | | |
|--|-------|-------|-------|
| <p>Title: Acquisition Strategy and Space Segment Prototyping Preparation Activities</p> <p>Description: This major thrust was formerly known as Acquisition Strategy and Source Selection. In accordance with these concept and architecture studies, ESS is conducting market research and working with Air Force Space Command (AFSPC) to define system requirements in support of acquisition strategy development. Increase in program office support for developing documentation and planning for activities leading up to and including a draft and final Request for Proposal (RFP) release and source selection. Finalize space segment acquisition activities for rapid, competitive prototyping with capability demonstration for up to three contractors leading up to, but not including, contract awards.</p> <p>FY 2019 Plans: Release Development RFP and conduct source selection in preparation for ESS Development Contract Authority To Proceed. Continue program office and other related support activities that may include, but are not limited to studies, technical analysis, market research, acquisition strategy development, RFP development, source selection, etc.</p> <p>FY 2020 Plans: Includes changes due to updated Section 804 acquisition approach and re-alignment of activities. Finalize space segment acquisition efforts in support of prototyping and capability demonstration. Plan for the Space Segment End Cryptographic Unit (ECU) Request for Proposal, source selection, and contract award. Activities include, but not limited to: Continued engagements with potential space contractors; technical evaluations; contractor selections and negotiations; and other activities leading to, but not including, prototyping contract awards. Plan and provide any program office support, government-furnished equipment, studies or technical analyses, information or resources in support of prototyping activities. Federally Funded Research Development Center (FFRDC) and University Affiliated Research Center (UARC) studies and technical support will assist with</p> | 5.467 | 5.846 | 4.329 |
|--|-------|-------|-------|

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | | R-1 Program Element (Number/Name) PE 1206855F / <i>Evolved Strategic SATCOM (ESS)</i> | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| requirements trades, technical approaches, threat assessment and mitigation approaches, prototyping strategy, and ESS testing assets. | | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 decreased compared to FY 2019 by \$1.517M. Justification for the decrease is described in plans above. | | | | |
| Title: Space Segment Prototyping | | 0.000 | 0.000 | 136.885 |
| Description: Award up to three competitive rapid-prototyping contracts. Invest in technology and demonstrations that enables continued development of modernized, strategic XDR-processed payload prototypes. Enables long-term return on investment and energizes industrial base for Strategic SATCOM, increased competition, promotion of innovation, and increased resiliency. Actively manage contractors through prototyping, demonstration and requirements/criteria needed for contractors to competitively bid on the ESS follow-on. Continues the prototyping and development of risk reduction efforts as previously described under FY 2019 President's Budget "ESS Development" major thrust. | | | | |
| FY 2019 Plans: N/A. | | | | |
| FY 2020 Plans: All efforts related to the design, development and build of components for early integrated testing of prototypes for up to three contractors. Efforts for each contract may include, but are not limited to, long-lead parts planning and purchase, procurement of contractor and government provided test equipment, manufacturing prototypes, and manpower ramp-up. Includes all required cryptography, cyber and resiliency support for each contract and Government contractor support for oversight and integration of up to three contracts. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, prototyping, etc. FFRDC and UARC studies and technical support will assist with requirements trades, technical approaches, threat assessment and mitigation approaches, prototyping strategy, and ESS testing assets. | | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 increased compared to FY 2019 by \$136.885M. Justification for the increase is described in plans above. | | | | |
| Title: ESS Ground Segment and Space-to-Ground Integration | | 0.000 | 5.846 | 30.992 |
| Description: Develop and field the ESS ground segment. Provide for space-to-ground integration for the ESS system. Refine the development efforts previously included under FY 2019 President's Budget "ESS Development" major thrust. | | | | |
| FY 2019 Plans: | | | | |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 1206855F / <i>Evolved Strategic SATCOM (ESS)</i> |
|--|---|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|---------|---------|---------|
| <p>Conduct studies and analyses to determine contractor capabilities to meet the requirements in preparation for Development Contract Award. Continue to define the space and ground architecture. Continue program office support and other related support activities.</p> <p>FY 2020 Plans: Includes changes due to updated Section 804 acquisition approach and re-alignment of activities. Continue acquisition activities in support of the ground segment and space-to-ground integration in accordance with the approved ESS Acquisition Strategy and schedule. Includes all program office and its contractor support for: Industry engagement; technical analysis/studies; RFP documentation preparation; technical evaluations; and contract awards. Plan and provide any government-furnished equipment or resources in support of future fielding and testing of ESS. Includes all required cryptography, cyber and resiliency activities required and Government contractor support for management and oversight. FFRDC and UARC studies and technical support will assist with requirements trades, technical approaches, threat assessment and mitigation approaches, prototyping strategy, and ESS testing assets.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 increased compared to FY 2019 by \$25.146M. Justification for the increase is described in plans above.</p> | | | |
| Accomplishments/Planned Programs Subtotals | 15.473 | 29.229 | 172.206 |

D. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

In the FY 2019 budget, ESS received a Congressional rescission of \$12.000 million. The correct total for FY 2018 is \$3.473 million.

E. Acquisition Strategy

The Milestone Decision Authority (MDA) designated ESS as an FY2016 National Defense Authorization Act Section 804 Rapid Prototyping activity and approved the ESS acquisition strategy on 14 December 2018. The Air Force plans to utilize FY2016 National Defense Authorization Act Section 804 (Public Law 114-92) Rapid Prototyping Authority for ESS. A rapid prototyping phase effectively replaces the Technology Maturation and Risk Reduction phase from a traditional acquisition under Department of Defense 5000 series Directives and Instructions. This approach allows up to three contractors to focus on reducing space segment risks with the objective of maximizing ESS demonstrated capability for a XDR-processed payload and other key technologies. An ESS Program Office-led RFP and source selection will eventually determine which space prototyping contractor, via their performance during the rapid prototyping phase, is best positioned for the follow-on contract award. The space prototyping contractors will be carried through the follow-on source selection to continue momentum until the follow-on contract is awarded.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| Appropriation/Budget Activity | R-1 Program Element (Number/Name) |
|--|---|
| 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | PE 1206855F / <i>Evolved Strategic SATCOM (ESS)</i> |

Return on investment from space prototyping will energize the industrial base and increase competition in strategic SATCOM; inject innovative technical, process and integration approaches; burn down risk early and identify/correct issues as early as possible; and decrease traditional fielding timelines to support a more resilient and responsive architecture against emerging threats. Success in the competitive rapid-prototyping determines and informs follow-on fielding.

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 1206855F / Evolved Strategic SATCOM (ESS) | Project (Number/Name) 643725 / Evolved Strategic SATCOM (ESS) |
|--|--|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Space Segment Prototyping | C/TBD | TBD : TBD | - | - | | - | | 104.705 | Feb 2020 | - | | 104.705 | Continuing | Continuing | - |
| Ground Segment and Space-to-Ground Integration | TBD | TBD : TBD | - | - | | 2.799 | Feb 2019 | 26.951 | Nov 2019 | - | | 26.951 | Continuing | Continuing | - |
| Requirement Definition | Various | Various : Various | - | 2.825 | Jan 2018 | 4.550 | Nov 2018 | - | | - | | - | Continuing | Continuing | - |
| Technical Mission Analysis | MIPR | Aerospace : El Segundo, CA | - | - | | 2.767 | Nov 2018 | 3.812 | Nov 2019 | - | | 3.812 | Continuing | Continuing | - |
| Enterprise SE&I | C/CPAF | Linquest : Los Angeles, CA | - | 0.607 | Jan 2018 | 11.604 | Nov 2018 | 13.952 | Nov 2019 | - | | 13.952 | Continuing | Continuing | - |
| FY 2018 Congressional rescission | Various | Not specified. : TBD | - | 12.000 | | - | | - | | - | | - | 0.000 | 12.000 | - |
| Subtotal | | | - | 15.432 | | 21.720 | | 149.420 | | - | | 149.420 | Continuing | Continuing | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| FFRDC | Various | Various : Various | - | - | | 5.138 | Nov 2018 | 8.610 | Nov 2019 | - | | 8.610 | Continuing | Continuing | - |
| Other Support | Various | Various : Various | - | 0.041 | Jan 2018 | 0.200 | Oct 2018 | 0.400 | Oct 2019 | - | | 0.400 | Continuing | Continuing | - |
| A&AS | Various | Various : Various | - | - | | 2.171 | Nov 2018 | 13.776 | Nov 2019 | - | | 13.776 | Continuing | Continuing | - |
| Subtotal | | | - | 0.041 | | 7.509 | | 22.786 | | - | | 22.786 | Continuing | Continuing | N/A |

| Project Cost Totals | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|--------------------|----------------|----------------|---------------------|--------------------|----------------------|-------------------------|-------------------|---------------------------------|
| | - | 15.473 | 29.229 | 172.206 | - | 172.206 | Continuing | Continuing | N/A |

Remarks

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 1206855F / <i>Evolved Strategic SATCOM (ESS)</i> | Project (Number/Name) 643725 / <i>Evolved Strategic SATCOM (ESS)</i> |

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
|---|--|
| ESS Development | |
| Ground Segment and Space-to-Ground Integration | |
| Space Segment Prototyping - Planning | |
| Acquisition Strategy Approval | |
| Space Segment Prototyping - Contract Awards (up to 3 contractors) | |
| Space Segment Prototyping - Execution (up to 3 contractors) | |
| Space Follow-On - Request for Proposal | |
| Space Follow-On - Contract Award | |
| Space Follow-On - Execution | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 1206855F / <i>Evolved Strategic SATCOM (ESS)</i> | Project (Number/Name) 643725 / <i>Evolved Strategic SATCOM (ESS)</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|---|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>ESS Development</i> | | | | |
| Ground Segment and Space-to-Ground Integration | 4 | 2018 | 4 | 2024 |
| Space Segment Prototyping - Planning | 4 | 2018 | 1 | 2020 |
| Acquisition Strategy Approval | 1 | 2019 | 1 | 2019 |
| Space Segment Prototyping - Contract Awards (up to 3 contractors) | 2 | 2020 | 2 | 2020 |
| Space Segment Prototyping - Execution (up to 3 contractors) | 2 | 2020 | 3 | 2023 |
| Space Follow-On - Request for Proposal | 3 | 2023 | 3 | 2023 |
| Space Follow-On - Contract Award | 3 | 2024 | 3 | 2024 |
| Space Follow-On - Execution | 3 | 2024 | 4 | 2024 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| Appropriation/Budget Activity | | | | | R-1 Program Element (Number/Name) | | | | | | | |
|--|--------------------|----------------|----------------|---------------------|--|----------------------|----------------|----------------|----------------|----------------|-------------------------|-------------------|
| 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | | | | | PE 1206857F / <i>Space Rapid Capabilities Office</i> | | | | | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| Total Program Element | - | 84.235 | 298.445 | 33.742 | 17.885 | 51.627 | 35.929 | 8.826 | 8.987 | 9.149 | Continuing | Continuing |
| 64A020: <i>AF Funded ORSSats</i> | - | 84.235 | 298.445 | 33.742 | 17.885 | 51.627 | 35.929 | 8.826 | 8.987 | 9.149 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

Note
PE 1206857F, Space Rapid Capabilities Office, changed from Operationally Responsive Space

A. Mission Description and Budget Item Justification

Per the FY 2018 NDAA, the Operationally Responsive Space (ORS) Office is now the Space Rapid Capabilities Office (Space RCO). Its mission is being broadened to expedite developing and fielding operationally focused capabilities for immediate and near-term needs as directed by the Space RCO Board of Directors. Key operating principles include a short and narrow chain of command, overarching programmatic insight, early and prominent war fighter involvement with small integrated operating teams within a single office. U.S. Strategic Command (USSTRATCOM) has identified three needs: 1) to rapidly augment existing space capabilities when needed to expand operational capability; 2) to rapidly reconstitute/replenish/protect critical space capabilities to reserve "continuity of operations" capability; 3) to rapidly exploit and infuse space technological or operational innovations to increase U.S. advantage. Space RCO projects are optimized for prioritized theater use and/or surge, augmentation, and replenishment of traditional space capabilities.

The Space RCO is ready to develop, test, train, and equip war fighter needs as they are identified at any time. First, the requirements must be validated by the commander, USSTRATCOM, acting through U.S. Space Command; second, the project must be approved by the Space RCO Board of Directors (BoD); third, the project will be executed by the Space RCO. If the effort is initiated during execution year, it will be described in the next year's budget exhibit.

The Space RCO is supporting the Electro-Optical/Infrared Weather Systems (EWS) capability addressing weather gap 1 (cloud characterization) and gap 2 (theater weather imagery). ORS-8, which was to have been a gap-filler between the new EWS program of record, has been cancelled due to the Defense Meteorological Satellite Program's (DMSP) end-of-life extending beyond the EWS potential launch date. The EWS launch date in 2024 will provide coverage of gaps 1 and 2 after DMSP's end-of-life. The Office is also developing the Space RCO Solar Power project to collect solar energy and provide uninterrupted, assured, and logistically agile power to expeditionary forces operating in unimproved areas such as forward operating bases. The remaining priorities are to satisfy the high priority needs for augmentation and reconstitution, including Missile Warning, Wideband Protected Communication, Narrowband Communication, Data Exfiltration, Space Situational Awareness, Electro-Optical/Infrared (EO/IR) imagery, Blue/Friendly Force Situational Awareness, Maritime Domain Awareness, Positioning, Navigation, and Timing, Remote Access Solar Power, Weather, and Battlefield ISR.

Additional developments include visionary, tailored, and future Space/Cyber projects to special operations forces (SOF) as well as to plan, develop, test and transition advanced technologies into space system prototypes and capabilities to meet known and emerging threats. Conduct architecture studies, modeling and stimulation, technical development, integration and test activities in preparation for transition of critical technologies into prototype or space program of record.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 1206857F / <i>Space Rapid Capabilities Office</i> |
|--|--|

The FY2020 funding request was reduced by \$9.0 million to account for the availability of prior year execution balances.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver Space RCO weapon system capabilities. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392F and 1206398F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 87.577 | 378.445 | 42.742 | 0.000 | 42.742 |
| Current President's Budget | 84.235 | 298.445 | 33.742 | 17.885 | 51.627 |
| Total Adjustments | -3.342 | -80.000 | -9.000 | 17.885 | 8.885 |
| • Congressional General Reductions | -1.027 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | -105.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 25.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | -0.007 | 0.000 | | | |
| • SBIR/STTR Transfer | -2.308 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | -9.000 | 17.885 | 8.885 |

Congressional Add Details (\$ in Millions, and Includes General Reductions)

Project: 64A020: *AF Funded ORSSats*

Congressional Add: *Blackjack*

| | FY 2018 | FY 2019 |
|---|----------------|----------------|
| | - | 25.000 |
| Congressional Add Subtotals for Project: 64A020 | - | 25.000 |
| Congressional Add Totals for all Projects | - | 25.000 |

Change Summary Explanation

FY 2019: Congress deleted -\$105 million from Space Solar Power as early to need, but without prejudice.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 1206857F / <i>Space Rapid Capabilities Office</i> |
|--|--|

FY 2020: \$9.000M reduction to account for the availability of prior year execution balances.

C. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|---------|---------|--------------|-------------|---------------|
| <p>Title: Operational Capabilities, Development, Enablers, Integration, and Rapid Assembly, Integration & Test</p> <p>Description: Execute urgent needs as identified by USSTRATCOM. Integrate space rapid capabilities and concepts, including resiliency, into operations plans of the combatant commands, tactics, techniques and procedures of the military departments, and exercises, demonstrations, and war games. Develop the Space RCO Solar Power project to collect solar energy and provide uninterrupted, assured, and logistically agile power to expeditionary forces operating in unimproved areas such as forward operating bases.</p> <p>FY 2019 Plans: Developing space-based solar power collection and transmission capability using light weight, high efficiency solar cells coupled with individual radio frequency transmitters to collect solar energy and provide uninterrupted, assured, and logistically agile power to expeditionary forces operating in unimproved areas such as forward operating bases.</p> <p>FY 2020 Base Plans: N/A</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 decreased compared to FY 2019 by \$178.245M. Justification for this decrease is completion of Space-based Solar Power effort with FY 2019 funding.</p> | 0.488 | 178.245 | 0.000 | - | 0.000 |
| <p>Title: Space RCO Board of Directors (BoD) Projects</p> <p>Description: Execute projects, under rapid acquisition authorities inherent to the Space RCO, that address emergent capabilities and respond to Commander, USSTRATCOM-validated requirements and other Space RCO BoD approved efforts to meet Joint Force Commander needs identified in year of execution.</p> <p>FY 2019 Plans: Initiate rapid prototyping projects that address emergent capabilities and respond to Commander, USSTRATCOM-validated requirements and other Space RCO BoD approved efforts as required to meet Joint Force Commander and warfighter needs. These activities may include, but are not limited to studies, technical analysis, prototyping, etc.</p> <p>FY 2020 Base Plans:</p> | 0.000 | 0.500 | 0.100 | - | 0.100 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 1206857F / <i>Space Rapid Capabilities Office</i> |
|--|--|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|---------|---------|--------------|-------------|---------------|
| <p>Continue to initiate rapid acquisition projects that address emergent capabilities and respond to Commander, USSTRATCOM-validated requirements and other Space RCO BoD approved efforts as required to meet Joint Force Commander and warfighter needs. These activities may include, but are not limited to studies, technical analysis, experimentation, prototyping, etc.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 decreased compared to FY 2019 by \$0.400M. Justification for the decrease is fewer project initiations.</p> | | | | | |
| <p>Title: Space RCO Development</p> <p>Description: Rapidly exploit and infuse space technological and operational innovations to increase U.S. advantage.</p> <p>FY 2019 Plans: Continuing to support the Electro-Optical/Infrared Weather Systems (EWS) capability addressing weather gap 1 (cloud characterization) and gap 2 (theater weather imagery). Continue to study the potential of beginning the theater installation of ORS-9 as a tactically persistent ISR response architecture. Continuing program office support and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc.</p> <p>FY 2020 Base Plans: Continue to support the EWS capability addressing weather gap 1 (cloud characterization) and gap 2 (theater weather imagery). Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc. The FY2020 funding request was reduced by \$9.0 million to account for the availability of prior year execution balances.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 decreased compared to FY 2019 by \$44.815M. Justification for this decrease is described in plans above.</p> | 72.902 | 69.557 | 24.742 | - | 24.742 |
| <p>Title: Space RCO: Cross Cutting</p> <p>Description: Provide systems engineering, program management support and civilian pay across all the Space RCO activities. Perform modeling, simulation, analysis, and assess alternative concepts and requirements. Support response to USSTRATCOM tasking and future mission development to meet Joint Force Commander (JFC) and warfighter needs.</p> | 10.845 | 12.748 | 8.900 | - | 8.900 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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|--|--|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 1206857F / <i>Space Rapid Capabilities Office</i> |
|--|--|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|---------|---------|--------------|-------------|---------------|
|---|---------|---------|--------------|-------------|---------------|

FY 2019 Plans:
Continuing ongoing systems engineering support of future mission development. Refining Space RCO CONOPS, Enterprise and Architecture, and Systems Engineering Processes. Continuing to lead, participate in, and support, as appropriate, the solidification of space doctrine. Continuing to support Combatant Commands. Investigating options and implementing technology, procedures, and concepts for reducing costs and shortening satellite deployment times. Activities may include, but are not limited to program office support, facilities, and studies.

FY 2020 Base Plans:
Continue ongoing systems engineering support of future mission development as well as Program Office support and potentially including Civilian pay. Refine Space RCO CONOPS, Enterprise and Architecture, and Systems Engineering Processes. Lead, participate in, and support, as appropriate, the solidification of space doctrine. Continue to support Combatant Commands. Investigate options and implement technology, procedures, and concepts for reducing costs and shortening satellite deployment times. Activities may include, but are not limited to program office support, facilities, and studies.

FY 2019 to FY 2020 Increase/Decrease Statement:
FY 2020 decreased compared to FY 2019 by \$3.848M. Justification for this increase is described in plans above.

| | | | | | |
|--|-------|--------|-------|--------|--------|
| Title: Space Related Tactical Communications and Cyber Enhancements for SOF | 0.000 | 12.395 | 0.000 | 17.885 | 17.885 |
|--|-------|--------|-------|--------|--------|

Description: Provides enhanced communication and cyber capabilities to support tactical operations by Quick Reaction Forces (QRF) and Special Operations Forces (SOF).

FY 2019 Plans:

- Fast Wanderer - Developing enemy location & vulnerability exploitation capability for advanced satellite communication systems & methods. Capability is being integrated into existing SOF satellite exploitation systems and 2-way data dissemination capabilities.
- Tip Association & De-Duplication - Building & integrating a system algorithm with multiple criteria that de-duplicates redundant enemy tip information in real time. Greatly reduces dissemination of duplicate information from one or more sources providing more clarity for SOF entities.
- Resilient Collection Architecture - Providing advanced 2-way cross-communication system, cross-classification, low probability of intercept/exploitation communications. Uses multi-communication (i.e. space, terrestrial, and ground) domains for maximized communication options for SOF.

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 1206857F / <i>Space Rapid Capabilities Office</i> |
|--|--|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|---------|---------|--------------|-------------|---------------|
| <p>-- SOF Nano Synthetic Aperture Radar - Providing high-resolution ISR from stratospheric aircraft, Unmanned Aerial Systems (UAS), high-altitude balloons; Anti-Access Area Denial capability; immune to cloud cover, severe weather, and adversary counter-measures.</p> <p>-- Kinetic Associated End Game - Building and testing an airborne geolocation system for new enemy communications capabilities for kinetic end game.</p> <p>-- Select Spector - Developing and implementing prototypes for satellite communications for SOF tactical radio systems providing Low Probability of Intercept communications through jamming environments with the potential for doubling channel capacity.</p> <p>-- Long Intermediate Gap Enhanced Reconnaissance (LINGER) - Building & integrating high altitude/long loiter platform architecture with shared precision geolocation capabilities in real time.</p> <p>-- Special Comms Transport Yield (SCOTY) - Providing robust special comms transport using a custom waveform on commercial Software Defined Radios (SDR). Enables collaborative machine-to-machine interoperability with other sensors.</p> <p>-- SOF ISR Real-Time On Board Processing - Delivering low-power high-capacity lightweight airworthy on-board data processor for exploiting high-bandwidth video and imagery data in real-time, and relaying data to the appropriate operations center for immediate display and analysis.</p> <p>FY 2020 Base Plans: N/A</p> <p>FY 2020 OCO Plans:</p> <ul style="list-style-type: none"> - ARAGORN - Extends limited comm capability in forward locations - cost is \$950K - IC CHAT - PKI capability for network chatting for deployed users with limited comm - cost is \$620K - Ka Band AIRCRAFT GEOLOCATION (KAG) - Improving SATCOM tracking and locating of enemy asset - \$2.34M - EW SENSOR INTEGRATION (EWSI) - Adds additional customer sensors to JICD 4.2 fabric - cost is \$1.25M - AVALON - Determine feasibility of space-enabled cyber operations capability generation - cost is \$950K - CASIO - Improving geolocation capabilities for sensors and merged into COTS radios - cost is \$975K - SIDEWINDER - BANK of DETECTORS - Providing integration of deployed | | | | | |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i> | R-1 Program Element (Number/Name) PE 1206857F / <i>Space Rapid Capabilities Office</i> |
|--|--|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|--|---------|---------|-----------------|----------------|------------------|
| sensors into an operational architecture - cost is \$1.8M - Advanced TTL Handsets - Enabling operators to efficiently communicate regarding sensitive operations - cost is \$3M - Denied GPS Capabilities - Providing backup capability in GPS-denied areas - cost is \$2.5M - Friendly Force Tracking (FFT) Ground equipment - Create newer FFT devices needed to accept covert waveforms - cost is \$3.5M <i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> FY 2020 OCO increased compared to FY 2019 OCO by \$5.490M. Justification for this increase is described in plans above. | | | | | |
| Accomplishments/Planned Programs Subtotals | 84.235 | 273.445 | 33.742 | 17.885 | 51.627 |

| | FY 2018 | FY 2019 |
|---|---------|---------|
| <i>Congressional Add:</i> Blackjack <i>FY 2019 Plans:</i> Blackjack objectives are to demonstrate the military utility of lower cost payloads, leverage commercial architectures, and demonstrate on-orbit data processing and autonomy. Funds are being used to support DARPA in developing payload concepts to Preliminary Design Review, understanding of commercial networks, and initial ground capabilities. | - | 25.000 |
| Congressional Adds Subtotals | - | 25.000 |

D. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

E. Acquisition Strategy

Expediently award contracts through Space RCO or partner organizations.

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 1206857F / <i>Space Rapid Capabilities Office</i> | Project (Number/Name) 64A020 / <i>AF Funded ORSSats</i> |
|--|--|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Operational Capabilities, Development, Enablers, and Rapid Assembly, Integration, & Test | Various | Various : Various | - | 0.488 | Mar 2018 | - | | - | | - | | - | Continuing | Continuing | - |
| Space RCO Solar Power | TBD | TBD : TBD | - | - | | 178.245 | Feb 2019 | - | | - | | - | Continuing | Continuing | - |
| ORS-5 Operations | SS/CPFF | MIT/LL : Boston, MA | - | 4.180 | Nov 2017 | - | | - | | - | | - | Continuing | Continuing | - |
| Support EO/IR Weather Systems | TBD | TBD : TBD | - | 61.719 | Jun 2019 | 69.057 | Apr 2019 | 24.742 | Nov 2019 | - | | 24.742 | Continuing | Continuing | - |
| Space RCO BoD approved projects | C/CPAF | Various : Various, NM | - | - | | 0.500 | Jul 2019 | 0.100 | Dec 2019 | - | | 0.100 | Continuing | Continuing | - |
| ORS-7 Modular Bus/Open Manufacturing | C/CPFF | Raytheon : Tucson, AZ | - | 0.053 | Mar 2018 | - | | - | | - | | - | 0.000 | 0.053 | 12.200 |
| Develop/modify software/hardware tools/models (OCO) | C/TBD | Various : Various | - | - | | 12.395 | May 2019 | 0.000 | | 17.885 | Dec 2019 | 17.885 | Continuing | Continuing | - |
| ORS-9 Persistence Response Architecture | Various | Various : Various | - | 6.950 | Aug 2018 | 0.500 | May 2019 | - | | - | | - | Continuing | Continuing | - |
| Blackjack | MIPR | DARPA : Various | - | - | | 25.000 | Jan 2019 | - | | - | | - | Continuing | Continuing | - |
| Subtotal | | | - | 73.390 | | 285.697 | | 24.842 | | 17.885 | | 42.727 | Continuing | Continuing | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| A&AS | Various | Various : Various | - | 8.537 | Dec 2017 | 8.651 | Dec 2018 | 6.432 | Dec 2019 | - | | 6.432 | Continuing | Continuing | - |
| FFRDC | Various | Various : Various | - | 2.308 | Dec 2017 | 4.097 | Dec 2018 | 2.468 | Dec 2019 | - | | 2.468 | Continuing | Continuing | - |
| Subtotal | | | - | 10.845 | | 12.748 | | 8.900 | | - | | 8.900 | Continuing | Continuing | N/A |

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract | |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|-----|
| Project Cost Totals | | - | 84.235 | 298.445 | 33.742 | 17.885 | 51.627 | Continuing | Continuing | N/A |

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|--|--------------------|----------------|--|---------------------|--------------------|---|----------------------------|-------------------|---------------------------------|--|
| Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force | | | | | | | Date: February 2019 | | | |
| Appropriation/Budget Activity 3600 / 4 | | | R-1 Program Element (Number/Name) PE 1206857F / <i>Space Rapid Capabilities Office</i> | | | Project (Number/Name) 64A020 / <i>AF Funded ORSSats</i> | | | | |
| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract | |

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 1206857F / <i>Space Rapid Capabilities Office</i> | Project (Number/Name) 64A020 / <i>AF Funded ORSSats</i> |

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
|--|--|
| Space Rapid Capabilities Office | |
| Operational Capabilities, Development, Enablers, and Rapid Assembly, Integration, & Test | |
| ORS-5 Space Situational Awareness Operations | |
| Modular Bus/Open Manufacturing (ORS-7) | |
| Cross-Cutting Activities: Modeling, Sim, Analysis, JFC Needs | |
| Space Solar Power | |
| Space RCO BoD approved projects | |
| Blackjack | |
| Support EO/IR Weather Systems | |
| ORS-9 Persistence Response Architecture | |
| Develop/modify software/hardware and models (OCO) | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 4 | R-1 Program Element (Number/Name) PE 1206857F / <i>Space Rapid Capabilities Office</i> | Project (Number/Name) 64A020 / <i>AF Funded ORSSats</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| Space Rapid Capabilities Office | | | | |
| Operational Capabilities, Development, Enablers, and Rapid Assembly, Integration, & Test | 1 | 2018 | 4 | 2018 |
| ORS-5 Space Situational Awareness Operations | 1 | 2018 | 4 | 2018 |
| Modular Bus/Open Manufacturing (ORS-7) | 1 | 2018 | 1 | 2019 |
| Cross-Cutting Activities: Modeling, Sim, Analysis, JFC Needs | 1 | 2018 | 4 | 2024 |
| Space Solar Power | 1 | 2019 | 4 | 2019 |
| Space RCO BoD approved projects | 2 | 2019 | 4 | 2023 |
| Blackjack | 2 | 2019 | 4 | 2019 |
| Support EO/IR Weather Systems | 3 | 2019 | 4 | 2021 |
| ORS-9 Persistence Response Architecture | 3 | 2019 | 4 | 2020 |
| Develop/modify software/hardware and models (OCO) | 3 | 2019 | 4 | 2020 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0604200F / <i>Future Advanced Weapon Analysis & Programs</i> |
|---|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|------------------------------------|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 5.108 | 39.602 | 246.200 | 0.000 | 246.200 | 169.400 | 171.400 | 0.000 | 0.000 | 0.000 | 631.710 |
| 653133: <i>Armament Subsystems</i> | - | 5.108 | 39.602 | 246.200 | 0.000 | 246.200 | 169.400 | 171.400 | 0.000 | 0.000 | 0.000 | 631.710 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | - | - |

A. Mission Description and Budget Item Justification

The Air Force Life Cycle Management Center, Air Dominance Division, will execute the Extended Range Weapon (ERWn) development program directly supporting the National Defense Strategy as a new start in FY19. ERWn is a Section 804, CSAF-directed prototype development of an advanced multi-role interceptor, designed to defeat missile defense threats. The development will include missile design, aircraft integration, ground/flight tests, prototypes, and provides opportunities for future fielding. The FY19 PB provided funding for risk reduction efforts and the FY20 PB fully funds the ERWn development program. The Air Force will collaborate with the Missile Defense Agency (MDA) to mutually develop engineering and test requirements.

The Air Force Life Cycle Management Center, Armament Systems Development Division plans and executes early Systems Engineering, portfolio acquisition planning, agile acquisition strategies, and risk reduction activities for future advanced weapon systems to defeat evolving threat scenarios and environments for major program milestone decisions and feasibility of future weapons concepts. Results enable highly informed decisions on agile acquisition initiatives to develop, refine, and integrate technologies into new weapons concepts to address warfighter, Air Staff, and OSD initiatives and strategies presented by the National Defense Strategy, Air Superiority 2030 Enterprise Capability Collaboration Team Flight Plan, Integrated Priority Lists, as examples. Conducts Section 804 rapid acquisition/prototyping efforts, pre-planning and execution of Joint Capability Technology Demonstrations (JCTD), and program management support and analysis to develop new capability systems, improve legacy systems, or determine feasibility of utilizing prototypes with advanced technology on fielded systems. Conducts Modeling, Simulation, and Analysis (MS&A). Examples of such efforts include but are not limited to: Stand-off Attack Weapon and Low Cost Decoy.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver Future Advanced Weapon Analysis and Programs capabilities. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, 0605898F, and 0605833F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD) | R-1 Program Element (Number/Name) PE 0604200F I Future Advanced Weapon Analysis & Programs |
|--|--|

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 5.100 | 39.602 | 0.000 | 0.000 | 0.000 |
| Current President's Budget | 5.108 | 39.602 | 246.200 | 0.000 | 246.200 |
| Total Adjustments | 0.008 | 0.000 | 246.200 | 0.000 | 246.200 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.185 | 0.000 | | | |
| • SBIR/STTR Transfer | -0.177 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 246.200 | 0.000 | 246.200 |

Change Summary Explanation

FY20 increase to accomplish missile design, aircraft integration, ground and flight tests, and initiation of prototypes for ERWn Development Program.

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
|---|----------------|----------------|---------------------|--------------------|----------------------|

| | | | | | |
|--|-------|--------|---------|-------|---------|
| Title: Extended Range Weapon (ERWn) | 0.000 | 39.602 | 246.200 | 0.000 | 246.200 |
|--|-------|--------|---------|-------|---------|

Description: The ERWn development program is a Section 804, CSAF-directed prototype development of an advanced multi-role interceptor, designed to defeat missile defense threats. The development will include missile design, aircraft integration, ground/flight tests, prototypes, and provides opportunities for future fielding. The Air Force will collaborate with MDA to mutually develop engineering and test requirements.

Includes A&AS, travel, supplies, software, civilian pay and program costs.

FY 2019 Plans:

Begin risk reduction efforts to identify and mitigate technical and/or performance constraints to include acquiring equipment and contracting with suppliers.

FY 2020 Base Plans:

Continue missile design/development, aircraft integration, and ground/flight tests required to initiate prototype builds.

FY 2020 OCO Plans:

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD) | R-1 Program Element (Number/Name) PE 0604200F I Future Advanced Weapon Analysis & Programs |
|--|--|

C. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|--|---------|---------|--------------|-------------|---------------|
| n/a | | | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: Increase from FY19 to FY20 is due to FY20 full year of development and test. | | | | | |
| Title: Planning for Development | | | | | |
| Description: Planning for Development will plan and execute early Systems Engineering, portfolio acquisition planning, agile acquisition strategies, and risk reduction activities for future advanced weapon systems to defeat evolving threat scenarios and environments. | | | | | |
| Includes A&AS, travel, supplies, software, civilian pay and program costs. | | | | | |
| FY 2019 Plans: No FY19 funds for this activity. | | | | | |
| FY 2020 Base Plans: No FY20 budget for this activity. | | | | | |
| FY 2020 OCO Plans: N/A | | | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: N/A. No increase or decrease. | | | | | |
| Title: Rapid Prototyping | | | | | |
| Description: Conduct rapid acquisition/prototyping efforts and Modeling, Simulation, and Analysis (MS&A) validated through integration of empirical data derived from prototypes and demonstrations. | | | | | |
| Includes A&AS, travel, supplies, software, civilian pay and program costs. | | | | | |
| FY 2019 Plans: No FY19 funds for this effort. | | | | | |
| FY 2020 Base Plans: No FY20 budget for this activity. | | | | | |
| FY 2020 OCO Plans: | | | | | |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0604200F / <i>Future Advanced Weapon Analysis & Programs</i> |
|---|---|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|--|---------|---------|-----------------|----------------|------------------|
| N/A | | | | | |
| <i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> N/A. No increase or decrease. | | | | | |
| Accomplishments/Planned Programs Subtotals | 5.108 | 39.602 | 246.200 | 0.000 | 246.200 |

D. Other Program Funding Summary (\$ in Millions)
N/A

Remarks

E. Acquisition Strategy
 Extended Range Weapon: Acquisition strategy is to award an Undefinitized Contract Award (UCA) in the 3rd Qtr FY19 with a projected definitive contract award in the 1st Qtr FY20. Definitive contract will be sole source fixed price incentive fee (FPIF).

Planning for development and rapid prototyping: Acquisition strategy is competitive prototyping; multiple vendors will be used to maximum extent possible.

F. Performance Metrics
 Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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| Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force | | | | | | | | | | | | Date: February 2019 | | | |
|---|------------------------|--------------------------------|-------------|--|------------|---------|------------|------------------------------|------------|-------------|------------|---------------------|------------------|------------|--------------------------|
| Appropriation/Budget Activity | | | | R-1 Program Element (Number/Name) | | | | Project (Number/Name) | | | | | | | |
| 3600 / 5 | | | | PE 0604200F / Future Advanced Weapon Analysis & Programs | | | | 653133 / Armament Subsystems | | | | | | | |
| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | | | |
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | Target Value of Contract |
| ERWn - Contractor Support | SS/FPIF | TBD : TBD | - | - | | 37.747 | Apr 2019 | 232.043 | Nov 2019 | 0.000 | | 232.043 | Continuing | Continuing | - |
| Subtotal | | | - | - | | 37.747 | | 232.043 | | 0.000 | | 232.043 | Continuing | Continuing | N/A |
| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | | | |
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | Target Value of Contract |
| ERWn - Aircraft Integration and Systems Engineering | TBD | Various : Various | - | - | | - | | 5.559 | Oct 2019 | 0.000 | | 5.559 | Continuing | Continuing | - |
| Subtotal | | | - | - | | - | | 5.559 | | 0.000 | | 5.559 | Continuing | Continuing | N/A |
| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | | | |
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | Target Value of Contract |
| ERWn - Government Test and Evaluation | TBD | Various : Various | - | - | | - | | 3.060 | Oct 2019 | 0.000 | | 3.060 | Continuing | Continuing | - |
| Subtotal | | | - | - | | - | | 3.060 | | 0.000 | | 3.060 | Continuing | Continuing | N/A |
| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | | | |
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | Target Value of Contract |
| PfD - Program Mngmt Administration | Various | Various : Eglin AFB, FL | - | 4.108 | Jun 2018 | - | | - | | - | | - | Continuing | Continuing | - |
| Rapid Prototyping - Program Mgmt Administration | Various | Various : Eglin AFB, FL | - | 1.000 | Jun 2018 | - | | - | | - | | - | Continuing | Continuing | - |
| ERWn - Program Mgmt Administration | Various | Various : Eglin AFB, FL | - | - | | 1.855 | Feb 2019 | 5.538 | Oct 2019 | 0.000 | | 5.538 | Continuing | Continuing | - |

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604200F / <i>Future Advanced Weapon Analysis & Programs</i> | Project (Number/Name) 653133 / <i>Armament Subsystems</i> |
|--|---|---|

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Subtotal | | | - | 5.108 | | 1.855 | | 5.538 | | 0.000 | | 5.538 | Continuing | Continuing | N/A |

Remarks
Includes A&AS contract, IT requirements, TDY and office supplies.

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|
| Project Cost Totals | - | 5.108 | 39.602 | 246.200 | 0.000 | 246.200 | Continuing | Continuing | N/A |

Remarks
Contractor will bill monthly and will not require progress payments.

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|---|---|---|
| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604200F / <i>Future Advanced Weapon Analysis & Programs</i> | Project (Number/Name) 653133 / <i>Armament Subsystems</i> |

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
|---|--|
| Extended Range Weapon (ERWn) | |
| Risk Reduction | ██████████ |
| Design, Integrate, Flight, and Ground Test, Prototype Build | ██ |
| Planning for Development | |
| Design, Engineering, Testing, Risk Reduction | ██████████ |
| Rapid Prototyping | |
| Rapid acquisition/prototyping efforts | ██████████ |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604200F / <i>Future Advanced Weapon Analysis & Programs</i> | Project (Number/Name) 653133 / <i>Armament Subsystems</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|---|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| Extended Range Weapon (ERWn) | | | | |
| Risk Reduction | 2 | 2019 | 1 | 2020 |
| Design, Integrate, Flight, and Ground Test, Prototype Build | 1 | 2020 | 4 | 2022 |
| Planning for Development | | | | |
| Design, Engineering, Testing, Risk Reduction | 1 | 2018 | 4 | 2018 |
| Rapid Prototyping | | | | |
| Rapid acquisition/prototyping efforts | 1 | 2018 | 4 | 2018 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0604201F / <i>PNT Resiliency, Mods, and Improvements</i> |
|---|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 97.943 | 46.731 | 67.782 | 0.000 | 67.782 | 45.000 | 51.000 | 11.000 | 0.000 | 0.000 | 319.456 |
| 651030: <i>GPS Receiver Development</i> | - | 97.943 | 46.731 | 67.782 | 0.000 | 67.782 | 45.000 | 51.000 | 11.000 | 0.000 | 0.000 | 319.456 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | - | - |

Note

PE 0604201F Line Item Title, PNT Resiliency, Mods, and Improvements (RMI) changed from Integrated Avionics Planning and Development.

In FY 2018, specific efforts initiated under PE 0305164F, NAVSTAR Global Positioning System (User Equipment) (Space), Project 643833, Military Global Positioning System User Equipment were transferred to PE 0604201F, Integrated Avionics Planning & Development, Project 651030, Aircraft Receiver Development, to realign resources with the execution responsibilities supporting aircraft weapon system platforms along with increased transparency to stakeholders.

A. Mission Description and Budget Item Justification

Positioning, Navigation and Timing (PNT) solutions are critical to defense operations by enabling delivery of precision fires, safe aerial navigation, and time coordination across multiple platforms and subsystems. PNT must be maintained in the face of emerging and continuously evolving electronic and cyber threats, requiring increased system resiliency and rapid adaptability similar to that historically required of electronic warfare systems. Evolving threats will drive upgrades such as Global Positioning System (GPS) receiver modernization, development of standard navigational system formats/interfaces, increased use of open system architecture design principles, incorporation of alternative navigation sources into navigational solutions, advanced anti-jam antennas, antenna electronics, radio frequency monitoring/locating/reporting capabilities, and precision clock improvements to maintain current and future force capabilities.

Efforts transferred from PE 0305164F and now conducted under PE 0604201F, Project 651030 includes Embedded GPS/Inertial Navigation System (INS) Modernized (EGI-M), Miniaturized Airborne GPS Receiver 2000 Modernization (MAGR-2K-M), Defense Advanced GPS Receiver (DAGR), Resilient EGI (R-EGI) development, anti-jam antenna/antenna electronics development, situational awareness devices and other advanced/non-GPS PNT solutions. Activities also include, but are not limited to, current program planning, rapid prototyping/concept development, execution and future program planning and support to other GPS enabled systems as required. Funds may be used to address emerging and short-notice Diminishing Manufacturing and Material Shortage (DMSMS) issues.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver PNT solutions. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, 0605898F, and 0605833F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0604201F / <i>PNT Resiliency, Mods, and Improvements</i> |
|---|---|

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 101.203 | 58.531 | 16.782 | 0.000 | 16.782 |
| Current President's Budget | 97.943 | 46.731 | 67.782 | 0.000 | 67.782 |
| Total Adjustments | -3.260 | -11.800 | 51.000 | 0.000 | 51.000 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | -11.800 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -3.260 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 51.000 | 0.000 | 51.000 |

Change Summary Explanation

FY 2018 reduction of -\$3.260 million for SBIR

FY 2019 Congressional reduction of \$11.8 million due to early to need.

FY 2020 increase of \$51.0 million to R-EGI, program studies resulted in increased AF investment.

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| Title: Embedded GPS/INS - Modernized (EGI-M) | 64.386 | 37.461 | 15.282 |
| Description: EGI-M is a combined INS/GPS aircraft position, navigation, and timing system. Program upgrades EGI design to enhance resiliency against existing and emerging navigational warfare threats, incorporating design features (such as interface standardization and software modularity) to incorporate alternative navigation and timing sources, where cost effective, to reduce DoD cost and time lines to respond to newly identified threats and maintain current force capabilities. Incorporates M-Code and ADS-B compliance capability into EGI receivers while addressing parts obsolescence, reducing configuration count from 260+ to a desired end-state of 16, and decreasing production and sustainment costs. | | | |
| FY 2019 Plans: Finalize Initial Capabilities Documents (ICD), conduct Preliminary Design Reviews (PDR) and Critical Design Reviews (CDR), and begin full qualification and environmental testing. | | | |
| FY 2020 Plans: | | | |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | | R-1 Program Element (Number/Name) PE 0604201F / <i>PNT Resiliency, Mods, and Improvements</i> | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| <p>Completes vendor CDR, begin delivery of engineering development models (EDM) and production development units, conduct test readiness reviews and begin test & evaluation (T&E) to include environmental and initial qualification testing.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding decreased due to higher priority Air Force requirements.</p> | | | | |
| <p>Title: MAGR-2K-M</p> <p>Description: MAGR-2K-M is an aircraft GPS receiver. Program increases MAGR-2K resiliency against existing and emerging navigational warfare threats while reducing cost and time lines to incorporate agile capabilities to respond to newly identified threats. Incorporates M-Code capability into MAGR-2K receivers while addressing parts obsolescence and providing a pathway to ADS-B Out implementation. Performs appropriate trade studies and incorporates additional resiliency features, such as alternate navigation inputs, where cost effective.</p> <p>FY 2019 Plans: Complete box level testing, complete group A qualification testing (safety of flight) and initiate group B testing (full qualification) to include environmental testing, and deliver Production Representative Units (PRU) for platform integration and flight test.</p> <p>FY 2020 Plans: Complete full qualification testing, PRU integration and flight test support. Conduct anomaly resolution.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding decreased because the requirements are decreasing as the system transitions from development to fielding.</p> | | 26.012 | 5.270 | 1.000 |
| <p>Title: PNT RMI - DAGR</p> <p>Description: DAGR is a vehicle-mounted and hand-held GPS receiver. Program improves DAGR receiver performance by integrating software and hardware capability enhancements into DAGR receivers while also addressing parts obsolescence and M-code integration, providing improved resiliency to mitigate current and emerging operational threats and maintain the navigational capability required for ground personnel and vehicles.</p> <p>FY 2019 Plans: Continue maturing system enhancements and initiate new trade studies to address any emerging operational threat to the DAGR system (as required).</p> <p>FY 2020 Plans: Develop M-code prototypes</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p> | | 3.773 | 2.000 | 0.500 |

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|---|--|---|----------------|----------------|
| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | | R-1 Program Element (Number/Name) PE 0604201F / <i>PNT Resiliency, Mods, and Improvements</i> | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| Funding decreased due to higher priority Air Force requirements. | | | | |
| Title: PNT RMI - Resilient EGI (R-EGI) | | 3.772 | 2.000 | 51.000 |
| Description: Establishes a Government Reference Architecture (GRA) embodying open systems architecture concepts, enabling and accelerating the transition of future resilient PNT DoD systems. Enables design and development of various aircraft PNT Line Replaceable Units (LRUs) that are rapidly upgradeable to counter evolving threats. Demonstrates the GRA through prototyping of an open R-EGI LRU. Program matures, prototypes, and tests promising PNT technologies/systems and develops transition paths to flow new technologies into new and/or existing PNT systems. Provides improved PNT resiliency to counter navigational warfare threats through the design, development, test, and transition of science and technology efforts to PNT systems. | | | | |
| FY 2019 Plans: Continue development of hardware standards, software navigation protocols and aircraft data/communication networking protocols required to address increased navigational data requirements, simulation capability, advanced receiver design. Initiate a R-EGI LRU prototyping effort necessary to demonstrate and test capabilities prior to product transition, evolving the prototype through to Preliminary Design Review. Develop programmatic plans for transition of hardware and software technologies into new and/or existing PNT systems. | | | | |
| FY 2020 Plans: Continue the R-EGI LRU prototyping effort, fabricating, and testing initial prototypes. Continue development of hardware standards and software navigation protocols, aircraft data/ communication networking protocols and advanced receiver designs. Continue to mature resilient PNT hardware and software technologies into new and/or existing PNT systems. | | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: Funding increased due to the initiation of the R-EGI LRU prototyping effort which increased the requirements over and above the previous standards and component development efforts. | | | | |
| Accomplishments/Planned Programs Subtotals | | 97.943 | 46.731 | 67.782 |
| D. Other Program Funding Summary (\$ in Millions) | | | | |
| N/A | | | | |
| Remarks | | | | |
| E. Acquisition Strategy | | | | |
| Modifications to existing receivers designs will occur via Engineering Change Proposals (ECP)/Task Orders on existing USAF contracts. The GRA and open standards associated with R-EGI may be developed in cooperation with an industry consortium or using Other Transaction Authorities (OTA). The R-EGI LRU prototyping will be conducted using an OTA. OTAs may be used where appropriate to support prototyping and/or open standards development. | | | | |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0604201F / <i>PNT Resiliency, Mods, and Improvements</i> |
|---|---|

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|---|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604201F / PNT Resiliency, Mods, and Improvements | Project (Number/Name) 651030 / GPS Receiver Development |
|--|--|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|---------------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| EGI-M (Honeywell) | SS/CPFF | Honeywell : Clearwater, FL | - | 2.717 | Nov 2018 | 0.865 | May 2019 | 8.861 | Oct 2019 | - | | 8.861 | Continuing | Continuing | - |
| EGI-M (Northrop Grumman) | SS/CPFF | Northrop Grumman : Woodland Hills, CA | - | 50.769 | Sep 2018 | 30.252 | Nov 2018 | 5.892 | Oct 2019 | - | | 5.892 | Continuing | Continuing | - |
| MAGR-2K-M | SS/CPFF | Raytheon : El Segundo, CA | - | 26.012 | Apr 2018 | 3.670 | May 2019 | 1.000 | Jul 2020 | - | | 1.000 | Continuing | Continuing | - |
| PNT RMI - DAGR | SS/CPFF | Collins Aerospace : Des Moines, IA | - | 0.550 | Jul 2018 | 2.000 | Jul 2019 | 0.500 | Oct 2019 | - | | 0.500 | Continuing | Continuing | - |
| PNT RMI - R-EGI | C/CPFF | TBD : TBD | - | 3.895 | May 2018 | 2.000 | May 2019 | 51.000 | Oct 2019 | - | | 51.000 | Continuing | Continuing | - |
| Subtotal | | | - | 83.943 | | 38.787 | | 67.253 | | - | | 67.253 | Continuing | Continuing | N/A |

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---------------------------------|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| EGI-M FFRDC | Various | MITRE Corp. : Bedford, MA | - | 2.000 | Oct 2017 | 1.590 | Oct 2018 | - | | - | | - | Continuing | Continuing | - |
| EGI-M Lab | PO | Integrated Spt Facility : GA | - | 1.100 | Jan 2018 | - | | - | | - | | - | 0.000 | 1.100 | - |
| Subtotal | | | - | 3.100 | | 1.590 | | - | | - | | - | Continuing | Continuing | N/A |

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| EGI-M | PO | Various : TBD | - | 0.000 | | 1.000 | Mar 2019 | - | | - | | - | 0.000 | 1.000 | - |
| MAGR-2K-M | PO | Various : TBD | - | - | | 1.600 | Mar 2019 | - | | - | | - | 0.000 | 1.600 | - |
| Subtotal | | | - | 0.000 | | 2.600 | | - | | - | | - | 0.000 | 2.600 | N/A |

Remarks
MAGR-2K-M DT using 746th \$800K and Cyber testing \$800K not specified activity/location; EGI-M DT using 746th and Cyber testing \$1M

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604201F / <i>PNT Resiliency, Mods, and Improvements</i> | Project (Number/Name) 651030 / <i>GPS Receiver Development</i> |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|-------------------|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| PNT | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| EGI-M TMRR (NGC) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| EGI-M TMRR (HI) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| EGI EMD (NGC) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| EGI EMD (HI) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| EGI EMD Testing | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MAGR-2K-M EMD | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MAGR-2K-M Testing | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| R-EGI | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604201F / <i>PNT Resiliency, Mods, and Improvements</i> | Project (Number/Name) 651030 / <i>GPS Receiver Development</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|-----------------------|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>PNT</i> | | | | |
| EGI-M TMRR (NGC) | 1 | 2018 | 4 | 2018 |
| EGI-M TMRR (HI) | 1 | 2018 | 1 | 2019 |
| EGI EMD (NGC) | 4 | 2018 | 1 | 2021 |
| EGI EMD (HI) | 1 | 2019 | 4 | 2021 |
| EGI EMD Testing | 1 | 2021 | 4 | 2021 |
| MAGR-2K-M EMD | 1 | 2018 | 4 | 2020 |
| MAGR-2K-M Testing | 1 | 2018 | 4 | 2021 |
| R-EGI | 3 | 2019 | 4 | 2023 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0604222F / <i>Nuclear Weapons Support</i> |
|---|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|--|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 2.910 | 4.468 | 4.406 | 0.000 | 4.406 | 16.376 | 12.360 | 7.093 | 6.442 | Continuing | Continuing |
| 654236: <i>Engineering Analysis</i> | - | 2.910 | 2.979 | 2.421 | 0.000 | 2.421 | 4.466 | 5.410 | 5.107 | 4.420 | Continuing | Continuing |
| 655708: <i>Nuclear Weapons Support</i> | - | 0.000 | 1.489 | 1.985 | 0.000 | 1.985 | 11.910 | 6.950 | 1.986 | 2.022 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

The Air Force Nuclear Weapons Center, Kirtland AFB, NM, is the primary executing agency for this program. The Air Force is tasked with maintaining and providing technical expertise on all AF nuclear weapons and weapon systems and with developing and maintaining counter-chemical, biological, radiological, and nuclear (C-CBRN) capabilities. This program provides resources for technical and programmatic activities which includes performing independent analyses on all AF nuclear weapons systems activities including weapons development and sustainment; interoperability; compatibility; safety, security, and reliability; Air Force legacy nuclear stockpile management/retirement; nuclear certification and nuclear certification management.

This program element includes necessary civilian pay expenses required to manage, execute, and deliver Nuclear Weapon Support weapon system capability. The use of such program funds is in addition to the civilian pay expenses budgeted in program elements 0605831F - Capability Integration and 0605833F - Nuclear Systems.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0604222F / <i>Nuclear Weapons Support</i> |
|---|--|

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 3.009 | 4.468 | 5.957 | 0.000 | 5.957 |
| Current President's Budget | 2.910 | 4.468 | 4.406 | 0.000 | 4.406 |
| Total Adjustments | -0.099 | 0.000 | -1.551 | 0.000 | -1.551 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -0.099 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | -1.551 | 0.000 | -1.551 |

Change Summary Explanation

FY19 SBIR \$99K.

FY20 \$1.55M adjustment due to higher AF priorities.

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|---|--------------------|----------------|----------------|---------------------|---|----------------------|----------------|----------------|---|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 5 | | | | | R-1 Program Element (Number/Name) PE 0604222F / Nuclear Weapons Support | | | | Project (Number/Name) 654236 / Engineering Analysis | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 654236: <i>Engineering Analysis</i> | - | 2.910 | 2.979 | 2.421 | 0.000 | 2.421 | 4.466 | 5.410 | 5.107 | 4.420 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

The Air Force Nuclear Weapons Center is the executing agency for this program. The Air Force is tasked with maintaining and providing technical expertise on all AF nuclear weapons and weapon systems and conducting mission-level cyber risk analysis, integrating cybersecurity into systems engineering, enhancing adaptability and agility via modular design and approaches, developing a cyber-savvy workforce, increasing assurance in fielded systems in a cost effective and efficient manner, increasing the integration of cyber intelligence and enabling cyber operation flights and cyber protection teams. This program provides resources for technical and programmatic activities which includes performing independent analyses on all AF nuclear weapons systems activities including weapons development and sustainment; interoperability; compatibility; training; safety, security, and reliability; Air Force legacy nuclear stockpile management/retirement; nuclear certification and nuclear certification management. The AFNWC will partner with external agencies to achieve cross cutting solutions to mitigate cyber vulnerabilities. The development of Model Based System Engineering will facilitate the testing and analysis of nuclear weapons systems.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Title: Engineering Analysis | 2.910 | 2.979 | 2.421 | 0.000 | 2.421 |
| Description: Provide the technical oversight of all Air Force (AF) nuclear weapons, delivery systems, and support systems. Provide the engineering and technical management expertise required in critical areas of nuclear weapons safety, security, reliability, operations, modernization, testing, certification, and counter proliferation. | | | | | |
| FY 2019 Plans: Continue to analyze and document nuclear weapons issues related to risk assessment, data collection, model development, model validation and verification, weapon effectiveness, and nuclear stockpile planning and requirements assessment. | | | | | |
| FY 2020 Base Plans: Continue to analyze and document nuclear weapons issues related to risk assessment, data collection, model development, model validation and verification, weapon effectiveness, and nuclear stockpile planning and requirements assessment. | | | | | |
| FY 2020 OCO Plans: None | | | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: | | | | | |

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604222F / <i>Nuclear Weapons Support</i> | Project (Number/Name) 654236 / <i>Engineering Analysis</i> |
|--|--|--|

| | | | | | |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
| Funding decreased due to de-scoped cyber engineering analysis work from FY19 to FY20. | | | | | |
| Accomplishments/Planned Programs Subtotals | 2.910 | 2.979 | 2.421 | 0.000 | 2.421 |

| | | | | | | | | | | | |
|--|----------------|----------------|---------------------|--------------------|----------------------|----------------|----------------|----------------|----------------|-------------------------|-------------------|
| C. Other Program Funding Summary (\$ in Millions) | | | | | | | | | | | |
| Line Item | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| • RDTE 07 64222F/674237: <i>EMP Certification</i> | 26.672 | - | - | - | - | - | - | - | - | 0.000 | 26.672 |
| • RDTE 05 64222F/655708: <i>Nuclear Weapons Support</i> | 0.000 | 1.489 | 1.985 | 0.000 | 1.985 | 11.910 | 6.950 | 1.986 | 2.022 | Continuing | Continuing |

Remarks

D. Acquisition Strategy

Cost Plus Award Fee (CPAF) and Military Interdepartmental Purchase Request (MIPR) will be used to obtain technical analyses and technical support for safety, operations, and counter proliferation assessments. Supporting activities are contracted separately using contract strategies deemed most appropriate to the effort. All contracts will be openly competed.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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|--|---|---|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604222F / Nuclear Weapons Support | Project (Number/Name) 654236 / Engineering Analysis |
|--|---|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| FFRDC Cybersecurity Vulnerability Analysis | MIPR | AEROSPACE : Kirtland AFB, NM | - | 0.790 | Sep 2018 | - | | 0.395 | Oct 2019 | - | | 0.395 | Continuing | Continuing | - |
| FFRDC Emulation of the Strategic Missile Integration Complex (SMIC) | MIPR | AEROSPACE : Kirtland AFB, NM | - | 0.757 | Sep 2018 | 0.790 | Mar 2019 | 0.790 | Oct 2019 | - | | 0.790 | Continuing | Continuing | - |
| Subtotal | | | - | 1.547 | | 0.790 | | 1.185 | | - | | 1.185 | Continuing | Continuing | N/A |

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|-----------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Secure Cyber Facility Support | MIPR | Various : Kirtland AFB, NM | - | 0.115 | Nov 2018 | 0.500 | Oct 2018 | - | | - | | - | 0.000 | 0.615 | - |
| Cyber Support | MIPR | AEROSPACE : Kirtland AFB, NM | - | 0.500 | Apr 2019 | - | | - | | - | | - | 0.000 | 0.500 | - |
| Science Advisory Board (SAB) | MIPR | TBD : Kirtland AFB, NM | - | - | | 0.379 | Oct 2018 | 0.150 | Oct 2019 | - | | 0.150 | Continuing | Continuing | - |
| Model Based Systems Engineering (MBSE) | Reqn | Not specified. : Kirtland AFB, NM | - | - | | 0.266 | Oct 2018 | - | | - | | - | Continuing | Continuing | - |
| Subtotal | | | - | 0.615 | | 1.145 | | 0.150 | | - | | 0.150 | Continuing | Continuing | N/A |

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Institute for Complex Additive Systems Analysis (ICASA) | MIPR | TBD : Socorro, NM | - | - | | 0.104 | Mar 2019 | 0.286 | Oct 2019 | - | | 0.286 | Continuing | Continuing | - |
| Subtotal | | | - | - | | 0.104 | | 0.286 | | - | | 0.286 | Continuing | Continuing | N/A |

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604222F / Nuclear Weapons Support | Project (Number/Name) 654236 / Engineering Analysis |
|--|---|---|

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| EZ A&AS | Various | Various : Kirtland AFB, NM | - | 0.040 | Oct 2018 | 0.795 | Oct 2018 | 0.350 | Dec 2019 | - | | 0.350 | Continuing | Continuing | - |
| Program Management Support (PMA) | Various | Various : Kirtland AFB, NM | - | 0.708 | Aug 2018 | 0.145 | Oct 2018 | 0.450 | Dec 2019 | - | | 0.450 | Continuing | Continuing | - |
| Subtotal | | | - | 0.748 | | 0.940 | | 0.800 | | - | | 0.800 | Continuing | Continuing | N/A |

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract | |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|-----|
| Project Cost Totals | | - | 2.910 | 2.979 | 2.421 | - | 2.421 | Continuing | Continuing | N/A |

Remarks
 FY19 to FY20 changes -- realigned some line items to the appropriate categories and combined like items.

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604222F / <i>Nuclear Weapons Support</i> | Project (Number/Name) 654236 / <i>Engineering Analysis</i> |
|--|--|--|

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|--|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---|---------|--|--|--|---------|--|--|--|---------|--|--|--|---------|--|--|--|---------|--|--|--|---------|--|--|--|---------|--|--|--|
| Engineering & Cyber Security Analysis | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cyber Security Vulnerability Assessments & Analysis | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Emulation of the SMIC | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Secure Cyber Facility Support | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Science Advisory Board | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MBSE | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ICASA - Test & Evaluation | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604222F / <i>Nuclear Weapons Support</i> | Project (Number/Name) 654236 / <i>Engineering Analysis</i> |
|--|--|--|

Schedule Details

| Events by Sub Project | Start | | End | |
|---|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Engineering & Cyber Security Analysis</i> | | | | |
| Cyber Security Vulnerability Assessments & Analysis | 4 | 2018 | 4 | 2024 |
| Emulation of the SMIC | 4 | 2018 | 4 | 2024 |
| Secure Cyber Facility Support | 1 | 2019 | 4 | 2019 |
| Science Advisory Board | 1 | 2019 | 4 | 2024 |
| MBSE | 1 | 2019 | 4 | 2024 |
| ICASA - Test & Evaluation | 1 | 2020 | 4 | 2024 |

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|---|--------------------|----------------|----------------|---------------------|---|----------------------|----------------|----------------|--|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 5 | | | | | R-1 Program Element (Number/Name) PE 0604222F / Nuclear Weapons Support | | | | Project (Number/Name) 655708 / Nuclear Weapons Support | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 655708: Nuclear Weapons Support | - | 0.000 | 1.489 | 1.985 | 0.000 | 1.985 | 11.910 | 6.950 | 1.986 | 2.022 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

New Weapon Generation Facilities (WGF) within AFGSC are adopting a new concept of operations by integrating maintenance and storage mission sets into one facility. To support mission generation requirements, facility support equipment and capabilities must be reviewed, modified or in extreme cases, re-developed in order to maintain operational readiness. Examples of equipment under review include but not limited to MB-4 & MHU-196/204. This review and potential modification of existing equipment ensures mission generation remains executable.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| Title: Weapon Generation Facility Material Handling Systems | 0.000 | 1.489 | 1.985 | 0.000 | 1.985 |
| Description: Weapon Generation Facility Material Handling System Review | | | | | |
| FY 2019 Plans: This effort initiates a review of material handling system equipment to accommodate new Weapon Generation Facilities (WGF) concept of operations by integrating maintenance and storage mission sets into one facility. Analysis will determine the ability of existing equipment capability to support mission generation requirements and facility support equipment. Analysis will determine whether modification or re-development of equipment is required. | | | | | |
| FY 2020 Base Plans: This effort will continue the review of material handling system equipment to accommodate new Weapon Generation Facilities (WGF) concept of operations by integrating maintenance and storage mission sets into one facility. Analysis will determine the ability of existing equipment capability to support mission generation requirements and facility support equipment. Analysis will determine whether modification or re-development of equipment is required. | | | | | |
| FY 2020 OCO Plans: none. | | | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: Funding increase due to growing number of WGFs being analyzed each year. | | | | | |
| Accomplishments/Planned Programs Subtotals | 0.000 | 1.489 | 1.985 | 0.000 | 1.985 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604222F / Nuclear Weapons Support | Project (Number/Name) 655708 / Nuclear Weapons Support |
|--|---|--|

C. Other Program Funding Summary (\$ in Millions)

| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> <u>Base</u> | <u>FY 2020</u> <u>OCO</u> | <u>FY 2020</u> <u>Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To</u> <u>Complete</u> | <u>Total Cost</u> |
|---|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|
| • RDTE 07 64222F/674237: <i>EMP Certification</i> | 26.972 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 26.972 |
| • RDTE 05 64222F/654236: <i>Engineering Analysis</i> | 2.910 | 2.979 | 2.421 | 0.000 | 2.421 | 4.466 | 5.410 | 5.107 | 4.420 | Continuing | Continuing |

Remarks

D. Acquisition Strategy

The acquisition strategy focuses on determining if the existing equipment can be modified or if a re-development effort is required. Once the analysis determines which course of action is required the appropriate acquisition strategy will be defined.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604222F / <i>Nuclear Weapons Support</i> | Project (Number/Name) 655708 / <i>Nuclear Weapons Support</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|---|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>WGF - Facility Support Equipment</i> | | | | |
| Market Research | 3 | 2019 | 2 | 2020 |
| Facility Support Equipment Modification/Development | 3 | 2020 | 4 | 2024 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0604270F / <i>Electronic Warfare Development</i> |
|---|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 2.159 | 1.909 | 2.066 | 0.000 | 2.066 | 2.102 | 2.145 | 2.185 | 43.580 | Continuing | Continuing |
| 653891: <i>Adv Infrared Counter Measures(Aircm)</i> | - | 2.159 | 1.909 | 2.066 | 0.000 | 2.066 | 2.102 | 2.145 | 2.185 | 43.580 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

The Advanced Infrared Countermeasure (AIRCМ) project contains related aircraft self-protection efforts aimed at increasing aircraft survivability against the increasing threat of sophisticated surface-to-air and air-to-air missiles. These missiles may employ sophisticated next-generation Electro-Optics (EO), Infrared (IR), Radio Frequency (RF), dual-mode (i.e. IR and RF), or multi-mode seekers. AIRCM will provide advanced expendable countermeasures and/or techniques that will be functionally compatible with existing dispenser systems and employed across multiple USAF weapons systems. This also explicitly includes any and all flare, chaff, decoy, and associated components development and testing that may be demanded or needed in current operations supporting the war on terrorism regardless of aircraft platform. Similar activities that are supplementary to this effort may be accomplished ad hoc using platform specific funding or through other activities such as joint services or NATO test groups.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver Advanced Infrared Countermeasure weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, and 0605898F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0604270F / <i>Electronic Warfare Development</i> |
|---|---|

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 2.241 | 1.909 | 2.066 | 0.000 | 2.066 |
| Current President's Budget | 2.159 | 1.909 | 2.066 | 0.000 | 2.066 |
| Total Adjustments | -0.082 | 0.000 | 0.000 | 0.000 | 0.000 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -0.082 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Change Summary Explanation

N/A

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| | | | | | | | | | | | | |
|---|--------------------|----------------|----------------|---------------------|---|----------------------|----------------|----------------|--|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 5 | | | | | R-1 Program Element (Number/Name) PE 0604270F / <i>Electronic Warfare Development</i> | | | | Project (Number/Name) 653891 / <i>Adv Infrared Counter Measures(Aircm)</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 653891: <i>Adv Infrared Counter Measures(Aircm)</i> | - | 2.159 | 1.909 | 2.066 | 0.000 | 2.066 | 2.102 | 2.145 | 2.185 | 43.580 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

The Advanced Infrared Countermeasure (AIRCМ) project contains related aircraft self-protection efforts aimed at increasing aircraft survivability against the increasing threat of sophisticated surface-to-air and air-to-air missiles. These missiles may employ sophisticated next-generation Electro-Optics (EO), Infrared (IR), Radio Frequency (RF), dual-mode (i.e. IR and RF), or multi-mode seekers. AIRCM will provide advanced expendable countermeasures and/or techniques that will be functionally compatible with existing dispenser systems and employed across multiple USAF weapons systems. This also explicitly includes any and all flare, chaff, decoy, and associated components development and testing that may be demanded or needed in current operations supporting the war on terrorism regardless of aircraft platform. Similar activities that are supplementary to this effort may be accomplished ad hoc using platform specific funding or through other activities such as joint services or NATO test groups.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver Advanced Infrared Countermeasure (AIRCМ) weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, 0605898F, and 0605833F.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| Title: Countermeasure Testing | 2.159 | 1.909 | 2.066 | 0.000 | 2.066 |
| Description: Testing and qualification of EO, IR, and RF countermeasures on aircraft | | | | | |
| FY 2019 Plans: Activities include testing and qualification of expendable countermeasure cocktails on various aircraft. | | | | | |
| FY 2020 Base Plans: Activities include testing and qualification of expendable countermeasure cocktails on various aircraft. | | | | | |
| FY 2020 OCO Plans: N/A | | | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: Funding increase minimal. | | | | | |
| Accomplishments/Planned Programs Subtotals | 2.159 | 1.909 | 2.066 | 0.000 | 2.066 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604270F / <i>Electronic Warfare Development</i> | Project (Number/Name) 653891 / <i>Adv Infrared Counter Measures(Aircm)</i> |

C. Other Program Funding Summary (\$ in Millions)

| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> | | | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To</u> | |
|---|----------------|----------------|----------------|------------|--------------|----------------|----------------|----------------|----------------|-----------------|-------------------|
| | | | <u>Base</u> | <u>OCO</u> | <u>Total</u> | | | | | <u>Complete</u> | <u>Total Cost</u> |
| • PAAF 01 Line Item 356010: <i>Flares</i> | 127.481 | 137.402 | 0.000 | 129.388 | 129.388 | 143.459 | 101.435 | 104.392 | 77.404 | Continuing | Continuing |
| • PAAF 01 352010: <i>Cartridges</i> | 205.853 | 188.277 | 0.000 | 193.091 | 193.091 | 186.551 | 171.852 | 168.021 | 149.779 | Continuing | Continuing |

Remarks

Qualified flares, if not in AF inventory, will be procured under program 0208030F War Reserve Munitions, Flares.

D. Acquisition Strategy

Contracts are awarded through the Department of Defense Ordnance Technology Consortium (DOTC). DOTC facilitates collaborative Government, Industry, and Academic ordnance technology development and prototyping initiatives. It serves as a single point contracting agent for development/technology demonstrations needed to advance and expand our military technological superiority.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|--|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604270F / <i>Electronic Warfare Development</i> | Project (Number/Name) 653891 / <i>Adv Infrared Counter Measures(Aircm)</i> |
|--|---|--|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Pulse Kinematic Development | C/CPFF | DOTC : ARDEC, PA | - | - | | - | | 0.896 | Jun 2020 | - | | 0.896 | Continuing | Continuing | - |
| IR/UV | C/CPAF | DOTC : ARDEC, PA | - | - | | - | | 0.300 | Jun 2020 | - | | 0.300 | Continuing | Continuing | - |
| Subtotal | | | - | - | | - | | 1.196 | | - | | 1.196 | Continuing | Continuing | N/A |

Remarks
Development of Advanced Expendable Countermeasures to defeat currently fielded threats from which aircraft are not sufficiently protected.

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---------------------------------|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Aircraft/Unit Support | MIPR | AATC : Tucson, AZ | - | 0.300 | Jun 2018 | 0.260 | Jun 2019 | - | | - | | - | Continuing | Continuing | - |
| Mission Planning | MIPR | MTSI : Las Vegas, NV | - | 0.300 | Jun 2018 | 0.260 | Jun 2019 | - | | - | | - | Continuing | Continuing | - |
| Subtotal | | | - | 0.600 | | 0.520 | | - | | - | | - | Continuing | Continuing | N/A |

Remarks
AATC supports ACC/CAF in coordinating and managing aircraft use to conduct advanced expendable countermeasure testing (this does not support other AMC or AFSOC)

Mission planning: Provides for programming of mission data required for each airframe and each expendable countermeasure or flare cocktail; this does not support AMC or AFSOC

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|---|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Modeling and Simulation | MIPR | Air Force Research Laboratory : WPAFB, OH | - | 0.330 | Jun 2018 | 0.245 | Jun 2019 | 0.850 | Jun 2020 | - | | 0.850 | Continuing | Continuing | - |
| Range Test | MIPR | 96th Test Wing : Eglin AFB, FL | - | 1.089 | Jun 2018 | 1.016 | Jun 2019 | - | | - | | - | Continuing | Continuing | - |

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|--|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604270F / <i>Electronic Warfare Development</i> | Project (Number/Name) 653891 / <i>Adv Infrared Counter Measures(Aircm)</i> |
|--|---|--|

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Test Support | MIPR | Various : NV | - | 0.120 | Jun 2018 | 0.108 | Jun 2019 | - | | - | | - | Continuing | Continuing | - |
| Subtotal | | | - | 1.539 | | 1.369 | | 0.850 | | - | | 0.850 | Continuing | Continuing | N/A |

Remarks

Modeling and simulation
 - This entails performance of modeling and simulation (to include threat hardware in-the-loop) which helps to predict advanced expendable countermeasure effectiveness and develop and define Air Force requirements
 - Performing activity varies; conducted by AFRL and GTRI

Range Test
 - This is the cost to use the range for testing (Radiometric, Captive Seeker, Flight, etc.)
 - Performing Activity & Location varies; 96th Test Wing, Eglin AFB, FL, White Sands Missile Range, NM, Gila Bend, AZ

Test Support
 - This includes but is not limited to Seeker Test Vans (multiple vans required for Captive Seeker), duo chrome camera, and other test equipment
 - Activities/support during testing (i.e. communications/electric/security)
 - Performing Activity & Location should remain "Various: TBD", multiple activities are included

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Program Office/ Government Support | Various | Air National Guard Air Force Reserve Command Test Center : Tucson, AZ | - | 0.020 | May 2018 | 0.020 | May 2019 | 0.020 | May 2020 | - | | 0.020 | Continuing | Continuing | - |
| Subtotal | | | - | 0.020 | | 0.020 | | 0.020 | | - | | 0.020 | Continuing | Continuing | N/A |

Remarks

AATC provides all the management, preparation and coordination of advanced expendable countermeasure testing efforts for ACC/CAF (this does not include support for AMC or AFSOC)

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|--|--------------------|----------------|---|--|---------------------|--------------------|--|-------------------------|-------------------|---------------------------------|--|
| Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force | | | | | | | Date: February 2019 | | | | |
| Appropriation/Budget Activity 3600 / 5 | | | R-1 Program Element (Number/Name) PE 0604270F / <i>Electronic Warfare Development</i> | | | | Project (Number/Name) 653891 / <i>Adv Infrared Counter Measures(Aircm)</i> | | | | |
| | Prior Years | FY 2018 | FY 2019 | | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract | |
| Project Cost Totals | - | 2.159 | 1.909 | | 2.066 | - | 2.066 | Continuing | Continuing | N/A | |

Remarks

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604270F / <i>Electronic Warfare Development</i> | Project (Number/Name) 653891 / <i>Adv Infrared Counter Measures(Aircm)</i> |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|------------------------------------|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| Advance IR Aircm | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| First FY18 Semi-Annual Test Event | | ■ | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Second FY18 Semi-Annual Test Event | | | | ■ | | | | | | | | | | | | | | | | | | | | | | | | |
| First FY19 Semi-Annual Test Event | | | | | | ■ | | | | | | | | | | | | | | | | | | | | | | |
| Second FY19 Semi-Annual Test Event | | | | | | | ■ | | | | | | | | | | | | | | | | | | | | | |
| First FY20 Semi-Annual Test Event | | | | | | | | | ■ | | | | | | | | | | | | | | | | | | | |
| Second FY20 Semi-Annual Test Event | | | | | | | | | | ■ | | | | | | | | | | | | | | | | | | |
| First FY21 Semi-Annual Test Event | | | | | | | | | | | ■ | | | | | | | | | | | | | | | | | |
| Second FY21 Semi-Annual Test Event | | | | | | | | | | | | ■ | | | | | | | | | | | | | | | | |
| First FY22 Semi-Annual Test Event | | | | | | | | | | | | | | ■ | | | | | | | | | | | | | | |
| Second FY22 Semi-Annual Event | | | | | | | | | | | | | | | ■ | | | | | | | | | | | | | |
| First FY23 Semi-Annual Test Event | | | | | | | | | | | | | | | | | ■ | | | | | | | | | | | |
| Second FY23 Semi-Annual Test Event | | | | | | | | | | | | | | | | | | ■ | | | | | | | | | | |
| First FY24 Semi-Annual Test Event | | | | | | | | | | | | | | | | | | | | | | ■ | | | | | | |
| Second FY24 Semi-Annual Test Event | | | | | | | | | | | | | | | | | | | | | | | | | ■ | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604270F / <i>Electronic Warfare Development</i> | Project (Number/Name) 653891 / <i>Adv Infrared Counter Measures(Aircm)</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|------------------------------------|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Advance IR Aircm</i> | | | | |
| First FY18 Semi-Annual Test Event | 2 | 2018 | 2 | 2018 |
| Second FY18 Semi-Annual Test Event | 4 | 2018 | 4 | 2018 |
| First FY19 Semi-Annual Test Event | 2 | 2019 | 2 | 2019 |
| Second FY19 Semi-Annual Test Event | 4 | 2019 | 4 | 2019 |
| First FY20 Semi-Annual Test Event | 2 | 2020 | 2 | 2020 |
| Second FY20 Semi-Annual Test Event | 4 | 2020 | 4 | 2020 |
| First FY21 Semi-Annual Test Event | 2 | 2021 | 2 | 2021 |
| Second FY21 Semi-Annual Test Event | 4 | 2021 | 4 | 2021 |
| First FY22 Semi-Annual Test Event | 2 | 2022 | 2 | 2022 |
| Second FY22 Semi-Annual Event | 4 | 2022 | 4 | 2022 |
| First FY23 Semi-Annual Test Event | 2 | 2023 | 2 | 2023 |
| Second FY23 Semi-Annual Test Event | 4 | 2023 | 4 | 2023 |
| First FY24 Semi-Annual Test Event | 2 | 2024 | 2 | 2024 |
| Second FY24 Semi-Annual Test Event | 4 | 2024 | 4 | 2024 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0604281F / <i>Tactical Data Networks Enterprise</i> |
|---|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---------------------------------------|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 42.128 | 270.015 | 229.631 | 0.000 | 229.631 | 202.397 | 202.505 | 192.550 | 70.647 | Continuing | Continuing |
| 655050: <i>TDL System Integration</i> | - | 32.544 | 251.157 | 229.631 | 0.000 | 229.631 | 156.151 | 121.293 | 127.904 | 57.837 | Continuing | Continuing |
| 655262: <i>Family of Gateways</i> | - | 9.584 | 18.858 | 0.000 | 0.000 | 0.000 | 46.246 | 81.212 | 64.646 | 12.810 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

The Tactical Data Networks Enterprise (TDNE) develops, enhances and fields Tactical Data Links (TDL), advanced waveforms, radios, network management tools, and associated hardware and software that comprise the Joint Aerial Layer Network (JALN). This will be accomplished by upgrading currently fielded communications and TDL systems and by developing and fielding more advanced future systems. TDNE also addresses warfighter urgent demands through the establishment of Quick Reaction Capabilities (QRC) and Enterprise activities as directed by the JALN council. TDNE supports the development, fielding and training of aerial layer networking capabilities across multiple core functions including air superiority, ground precision attack, command and control, intelligence, surveillance and reconnaissance (ISR), and personal recovery while integrating capabilities with space operations. These activities provide the Joint Forces Air Component Commander (JFACC) with networks to build a common operating picture of the battlespace. TDNE executes quick reaction response capability requests by the warfighter and support activities (including ramp-up) associated with the Joint Aerial Layer Network (JALN) Enterprise activities as directed by the JALN Council. This program ensures the continued enhanced interoperability of Air Force and joint/coalition/NATO assets through efforts such as early systems engineering and use of the Political, Operational, Economic and Technical (POET) process for program requirements analysis and architectural design development/coordination of all TDN standards and management capabilities, configuration management, platform/system interoperability assessments, development of government reference architectures, interoperability certification testing, and flight testing. Protected Tactical Waveform (PTW) is a waveform designed to mitigate the effects of advanced jamming in Anti-Access/Area Denial environments. PTW provides worldwide, beyond line of sight, Anti-Jam (AJ), Low Probability of Intercept communications, via military and commercial satellite systems for tactical users in all services. This effort funds PTW modem development and aperture development on suitable platforms like (but not limited to) RQ-4 and BACN. PTW provides communication path diversity by increasing SATCOM resilience through satellite, spectral, and waveform diversity. This effort continues work started in Protected Tactical Service Field Demonstration (PTSFD) to complete PTW maturity and modem development, leveraging TALON Tacet Avis aperture work to develop the PTW antenna and radome. It includes terminal certification efforts (Information Assurance (IA), NSA and MIL-STD). This effort funds continued development of PTW components, protected tactical terminal modems that will be capable of being fully integrated into existing wideband terminals and will ensure delivery of protected tactical SATCOM to the joint and coalition warfighters in contested and degraded environments. PTW development activities may also include technical and acquisition-related studies, analysis, early systems engineering and risk reduction activities, addressing all subsystems to support both current program planning/execution and future AF program planning.

TDL System Integration will provide for the study (acquisitions current and proposed), analysis, enhancement, development, integration, demonstration, test, and evaluation of Tactical Data Links (TDLs) as a subset of the broader aerial layer networks. TDLs are used in both peace time and combat environments to exchange information such as character-oriented and fixed-formatted messages, data, radar tracks, target information, platform status, imagery, free-text messaging and command assignments. TDLs provide interoperability, local and global connectivity, and situational awareness to the user when training or fighting under rapidly changing operational conditions. TDLs increase mission effectiveness by providing enhanced air domain situational awareness, positive combat identification of aircraft in the

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0604281F / <i>Tactical Data Networks Enterprise</i> | |
| <p>network, fusion/correlation of on- and off-board sensor data, digital sharing of machine-to-machine target and threat information, thereby, enabling time critical targeting and other mission assignment tasking. TDLs are used by all service theater command and control (C2) elements, weapons platforms, and sensors. TDLs include, but are not limited to: Link 16, Link 11, Link 22, Situational Awareness Data Link (SADL), Variable Message Format (VMF), Intra-Flight Data Link (IFDL), and other Advanced TDL Link technologies, such as Tactical Targeting Network Technology (TTNT), Common Data Link (CDL), and Multifunction Advanced Data Link (MADL). TDLs typically include both a waveform specification as well as the standards for exchanging messages. Agile Communications include the capability to share tactically significant information within/to/from highly contested environments in support of the Air Superiority 2030 Flight Plan. Agile Communication efforts provide for pre-Analysis of Alternatives (AoA) and development activities. High Capacity Backbone (HCB), a subset of the overall JALN concept, will provide the warfighter with a robust communication infrastructure enhancing C2 capabilities. HCB connects users operating within disadvantaged conditions to space and terrestrial communications utilizing Deployed Ground Entry Points (DGEP) and aerial nodes. Link 16 Enhancements will develop and field a Link 16 Anti Jam (AJ) capability on 4th and 5th generation platform to address Link 16 jamming threats in the contested and highly contested environments. Link 16 Enhancements funding will be utilized for Non-recurring engineering and integration of AJ capabilities on airborne and ground platforms. To address future Advanced Tactical Datalinks, development of a Software Programmable OMS compliant (SPOC) radio terminal is being studied. SPOC will provide a next generation radio set capable of hosting a variety of advanced tactical datalinks.</p> <p>Family of Gateway provides for the study (acquisitions current and proposed), analysis, enhancements, development, integration, costing, demonstration, test, and evaluation efforts that will allow joint combat forces to exchange information quickly and accurately by bridging discrete airborne, terrestrial, maritime, and space-based C4ISR networks producing operational effects not possible within individual networks. Gateway functions include enabling interoperability between data formats, protocols, and communication mediums. Additionally, gateway functions extend the connectivity range, consolidate data from multiple networks into high capacity links for transmission to key C2ISR nodes, route information between disadvantaged users, and fuse/correlate data from multiple sources to improve accuracy. Gateway functions also provide application hosting, shared data storage, on-demand information access, smart data forwarding, and system monitoring and network management. Further, this project supports 5th-to-4th Generation efforts and future TDL communications development. Additionally, Family of Gateways will support to enhance existing TDL performance, through upgrades and engineering analysis of system designs. Efforts in this project include waveform, ground, and rapid acquisition activities supporting Air Force requirements for communication bridging across multiple platforms, sources and communication domains. Moreover, the E-3G AWACS, 5th-to-4th Generation Gateway effort provides 4th Generation tactical edge assets with a common tactical operating picture for enhanced battlespace awareness via integration of 5th Generation sensor data. This effort integrates the core components (5th-to-4th Gateway, Correlation/fusion, and National sensor inputs) for use on the E-3G platform.</p> <p>As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.</p> <p>This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.</p> | | |

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0604281F / <i>Tactical Data Networks Enterprise</i> |
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| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 38.250 | 207.746 | 261.742 | 0.000 | 261.742 |
| Current President's Budget | 42.128 | 270.015 | 229.631 | 0.000 | 229.631 |
| Total Adjustments | 3.878 | 62.269 | -32.111 | 0.000 | -32.111 |
| • Congressional General Reductions | -1.743 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 50.000 | | | |
| • Congressional Directed Transfers | 0.000 | 14.888 | | | |
| • Reprogrammings | 7.021 | 0.000 | | | |
| • SBIR/STTR Transfer | -1.400 | 0.000 | | | |
| • Other Adjustments | 0.000 | -2.619 | -32.111 | 0.000 | -32.111 |

Change Summary Explanation

FY 2018:

- Project 655050, funding was increased by \$7.0 million BTR to fund 5th-to-4th UON
- Project 655050, funding was decreased due to \$1.4 million SBIR and 1.7 million for a congressional reduction.
- The total for FY18 project net change is \$3.8 million

FY 2019:

- Project 655050, funding was increased by \$50.0 million congressional add to accelerate ABMS
- Project 655050, funding was increased by \$14.888 million as a technical adjustment for PTW
- Project 655050, funding was decreased by \$2.619 million for an MDAP penalty
- The total for FY19 project net change is \$62.269 million

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604281F / <i>Tactical Data Networks Enterprise</i> | Project (Number/Name) 655050 / <i>TDL System Integration</i> |
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| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---------------------------------------|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| 655050: <i>TDL System Integration</i> | - | 32.544 | 251.157 | 229.631 | 0.000 | 229.631 | 156.151 | 121.293 | 127.904 | 57.837 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

Note

In FY 2018, Project Cursor on Target (CoT) was terminated

A. Mission Description and Budget Item Justification

Tactical Data Links (TDL) System Integration provides for the study, analysis, enhancement, development, integration, demonstration, joint/coalition/NATO interoperability exercises, costing, test, trials, and evaluation of TDL as a subset of the broader aerial layer network. TDLs are used in both peacetime and combat environments to exchange information such as character-oriented and fixed-formatted messages, data, radar tracks, target information, platform status, imagery, free-text messaging and command assignments. TDLs provide interoperability, local and global connectivity, and situational awareness to the user when training or fighting under rapidly changing operational conditions. TDLs increase mission effectiveness by providing enhanced air domain situational awareness, positive combat identification of aircraft in the network, fusion/correlation of on- and off-board sensor data, digital sharing of machine to machine target and threat information and, thereby, enabling time critical targeting and other mission assignment tasking. TDLs are used by all service, NATO, and coalition theater C2 elements, weapons platforms, and sensors.

The number of Air Force platforms hosting TDLs has expanded from C2 aircraft (E-3, E-8, E-11A, EQ-4B, etc.) to the fighter, bomber, intelligence, surveillance and reconnaissance (ISR), tanker, airlift and other tactical fleets (F-15, F-16, F-22A, Rivet Joint, B-1, B-2, B-52, KC-46, etc.), as well as precision guided munitions. Utilization of TDLs in joint and international environments requires the integration of terminals into host platforms and interoperability of TDL networks across all deployed joint/Coalition/NATO platforms. Recent mandates require additional studies and analysis in order to meet frequency reprogramming and cryptographic requirements.

Efforts in this project include waveform and integration activities.

Waveform:

Waveform activities include, but are not limited to, enabling and supporting Joint Interoperability of Tactical Command and Control Systems (JINTACCS), joint/Coalition/NATO Interoperability, Link 16 enhancements, and development of a next generation waveform and/or advanced tactical data link. Funding will provide training, logistics development, testing and certification of individual TDL implementations to joint/allied standards, establishment of service-wide network management procedures/operations, and system wide enhancements/testing, demonstration and experimentation.

Integration:

Integration activities include but are not limited to, Data Link Test Facility (DTF), MIDS JTRS, Air Force Participating Test Unit (AFPTU), Interoperable System Management and Requirements Transformation (iSMART), Network Centric Capability Assessment (NCCA), NATO interoperability, Coalition interoperability, TDL

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Planning, Analysis, and Monitoring (TDL PAM), integration analysis of C2 of JALN, Combat Cloud, Protected Tactical Waveform (PTW) and analysis of integration on platforms of existing TDN systems, system-of-systems analysis. Funding will ensure continued enhanced interoperability of Air Force/joint/Coalition/NATO assets through efforts such as early systems engineering and use of the POET process for program requirements analysis and architectural design development/coordination of all TDN standards and management capabilities, configuration management, platform/system interoperability assessments, development of government reference architectures, integration of cyber technologies, interoperability certification testing, and flight testing, demonstration and experimentation.

Activities also include studies, prototypes and analysis (engineering and cost) to support both current program planning and execution and future program planning efforts for Tactical Data Networks (TDN), including development of joint concepts for C2 of JALN, JALN Analysis of Alternatives (AoA) follow-on analysis, and JALN gateway planning.

Activities will also include joint/Coalition/NATO Interoperability that provides program office system engineering to support Foreign Military Sales (FMS) case development, FMS planning for tech refresh modifications, Crypto-Modernization, and Net Management.

Agile Communications include the capability to share tactically significant information within/to/from highly contested environments in support of the Air Superiority 2030 Flight Plan. Agile Communication efforts provide for pre-Analysis of Alternatives (AoA) and development activities. Agile Communications supports the application of open standards & advanced apertures over an Enterprise-wide Aerial Network, enabling all platforms to share combat-relevant data/info to, from & within the Highly Contested Environment (HCE).

High Capacity Backbone (HCB) effort implements an incremental approach for deploying resilient reach back connectivity to DISN services and in-theater rear echelon organizations through dedicated aerial gateways and opportunistic airborne nodes. The HCB Transport supports a robust deployable ground infrastructure required, through reach back, range extension and payload control. It will use an open system approach composed of non-proprietary government and commercial interface standards.

Link 16 Enhancement will develop and field Link 16 Anti-Jam (AJ) capabilities on 4th and 5th generation platforms to address Link 16 jamming threats in the contested and highly contested environments. Focus will be directed toward non-recurring engineering and integration of AJ capabilities on airborne and ground platforms.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver TDL weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F and 0605898F.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|--|---------|---------|--------------|-------------|---------------|
| Title: Tactical Data Networks (TDN) Integration | 13.943 | 66.814 | 19.388 | 0.000 | 19.388 |

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B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|--|---------|---------|--------------|-------------|---------------|
| <p>Description: TDN Integration activities include but are not limited to, Data Link Test Facility (DTF), Air Force Participating Test Unit (AFPTU), Network Centric Capability Assessment (NCCA), Joint/Coalition/NATO Interoperability, Joint Aerial Layer Network (JALN) Analysis of Alternatives (AoA) follow-on, JALN gateway planning.</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none"> -Will continue to manage the development, certification, developmental training, and logistics plans for individual TDL implementations to joint/allied standards - Will continue to provide management with the necessary engineering, technical, and administrative support needed to facilitate development -Will continue to plan for testing, integration, and associated training for MIDS JTRS upgrade configurations -Will continue to provide support to TDL interoperability testing of development and fielded systems through the DTF -Will continue support to DoD-mandated TDL MIL-STD conformance testing and interoperability assessments for all TDL-capable Air Force platforms through the AFPTU -Will continue to conduct aerial layer network focused studies and analysis that support data link enhancements - Will continue to assess tactical airborne network and network management gaps that are validated in existing requirements documents through the Network Centric Capability Assessments (NCCA) -Studies and analysis will include, but will not be limited to, supporting both current program planning and execution and future program planning efforts for TDN (e.g. development of joint concepts for C2 and network management of the Joint Aerial Layer Network (JALN), Combat Cloud, and JALN gateway planning) -Will continue to provide support to Coalition interoperability and provide program office system engineering to support NATO C3I, Foreign Military Sales (FMS) case development, FMS planning for technology refresh modifications, Crypto-Modernization, and Net Management - Will provide support to the DTF and AFPTU with required hardware and software upgrades and license renewals, which provide development and interoperability support for new capabilities and technology growth. - Will provide support to Agile Communications efforts that include pre-Analysis of Alternatives (AoA) and development activities <p>FY 2020 Base Plans:</p> <ul style="list-style-type: none"> -Will continue to manage the development, certification, developmental training, and logistics plans for individual TDL implementations to joint/allied standards | | | | | |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
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| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| <p>- Will continue to provide management with the necessary engineering, technical, and administrative support needed to facilitate development</p> <p>-Will continue to plan for testing, integration, and associated training for MIDS JTRS upgrade configurations</p> <p>-Will continue to provide support to TDL interoperability testing of development and fielded systems through the DTF</p> <p>-Will continue support to DoD-mandated TDL MIL-STD conformance testing and interoperability assessments for all TDL-capable Air Force platforms through the AFPTU</p> <p>-Will continue to conduct aerial layer network focused studies and analysis that support data link enhancements</p> <p>- Will continue to assess tactical airborne network and network management gaps that are validated in existing requirements documents through the Network Centric Capability Assessments (NCCA)</p> <p>-Studies and analysis will include, but will not be limited to, supporting both current program planning and execution and future program planning efforts for TDN (e.g. development of joint concepts for C2 and network management of the Joint Aerial Layer Network (JALN), Combat Cloud, and JALN gateway planning)</p> <p>-Will continue to provide support to Coalition interoperability and provide program office system engineering to support NATO C3I, Foreign Military Sales (FMS) case development, FMS planning for technology refresh modifications, Crypto-Modernization, and Net Management</p> <p>- Will provide support to the DTF and AFPTU with required hardware and software upgrades and license renewals, which provide development and interoperability support for new capabilities and technology growth.</p> <p>- Will provide support to Agile Communications efforts that include pre-Analysis of Alternatives (AoA) and development activities</p> <p>FY 2020 OCO Plans: N/A</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: N/A</p> | | | | | |
| <p>Title: Joint Interoperability of Tactical Command and Control Systems (JINTACCS)</p> <p>Description: Joint Interoperability of Tactical Command and Control Systems (JINTACCS) ensures interoperability of TDL systems with associated joint, allied, and Coalition systems. It includes configuration management of TDL Military Standards (MIL-STDs), TDL message development, interoperability test/certification, and TDL message standard implementation using interoperable System Management and Requirements Transformation (iSMART) for Link 11A/B, Link 16, Link 22, Variable Message Format (VMF),</p> | 2.665 | 9.414 | 6.555 | 0.000 | 6.555 |

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| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
| <p>Integrated Broadcast Service (IBS), Intra-flight Data Link (IFDL), Multifunction Advanced Data Link (MADL), and others.</p> <p>FY 2019 Plans: -Will continue to provide the necessary engineering, technical, and administrative support required to add and/or update Air Force platform and system information exchange requirements -Will continue to ensure compatibility and interoperability of TDLs by funding required Air Force/joint MIL-STD compliance and interoperability tests -Will continue to ensure compatibility and interoperability of TDLs by developing TDL messaging capability to address new or updated operational requirements</p> <p>FY 2020 Base Plans: -Will continue to provide the necessary engineering, technical, and administrative support required to add and/or update Air Force platform and system information exchange requirements -Will continue to ensure compatibility and interoperability of TDLs by funding required Air Force/joint MIL-STD compliance and interoperability tests -Will continue to ensure compatibility and interoperability of TDLs by developing TDL messaging capability to address new or updated operational requirements</p> <p>FY 2020 OCO Plans: N/A</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: N/A</p> | | | | | |
| <p>Title: Protected Tactical Waveform (PTW)</p> <p>Description: Protected Tactical Waveform (PTW) is a waveform designed to mitigate the effects of advanced jamming in Anti-Access/Area Denial environments. PTW provides worldwide, beyond line of sight, Anti-Jam (AJ), Low Probability of Intercept communications, via military and commercial satellite systems for tactical users in all Services. This effort funds PTW modem development and aperture development on suitable platforms like (but not limited to) RQ-4 Global Hawk and EQ-4B/E-11A Battlefield Airborne Communications Node (BACN). PTW provides communications path diversity by increasing SATCOM resilience through satellite, spectral, and waveform diversity. This effort continues work started in Protected Tactical Service Field Demonstration (PTSFD) to complete PTW maturity and modem development, leveraging TALON Tacet Avis aperture work to develop PTW antenna and radome. It includes terminal certification efforts (Information Assurance (IA), NSA and</p> | 0.000 | 12.000 | 14.888 | 0.000 | 14.888 |

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| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| <p>MIL-STD). This effort funds continued development of PTW components, protected tactical terminal modems that will be capable of being fully integrated into existing wideband terminals and will ensure delivery of protected tactical SATCOM to the joint and coalition warfighters in contested, degraded environments. PTW development activities may also include technical and acquisition related studies, analysis, and early systems engineering and risk reduction activities addressing all subsystems to support both current program planning/execution and future AF program planning.</p> <p>FY 2019 Plans: -Protected Tactical Waveforms (PTW) development is a new start in FY19 under PE 0604281F -Continue PTW modem development and aperture development on suitable platforms like (but not limited to) RQ-4 Global Hawk and EQ-4B/E-11A Battlefield Airborne Communications Node (BACN). -Will submit an RFI regarding the BiFrost to develop and prototype of the PTWSAT radio terminal -Will prepare acquisition strategy and prepare RFP package and award</p> <p>FY 2020 Base Plans: - Will continue the development and test of the prototype of the PTWSAT radio terminal</p> <p>FY 2020 OCO Plans: N/A</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: N/A</p> | | | | | |
| <p>Title: TDL Planning, Analysis, and Monitoring (TDL PAM)</p> <p>Description: The Air Force has a requirement for a TDL network planning, analysis and monitoring capability. TDL PAM's operational requirements are to support the Joint Interface Control Officer (JICO) in the Air and Space Operations Center (AOC); Regional Interface Control Officer (RICO) in the Control Reporting Center (CRC); and Interface Control Officers in the Defense Sectors during the execution and management of the Joint Multi-Tactical Data Link Network (MTN) architecture. Network complexity, large AORs, challenging terrain, and capacity issues within the MTN require a management tool that helps operators plan for the effective use of MTN capabilities.</p> <p>FY 2019 Plans: -Procure the Navy's Link Monitoring and Management Tool (LMMT) for test and evaluation at the Ryan Center -RDT&E funds for development of the Platform J capability</p> | 0.036 | 29.000 | 27.000 | 0.000 | 27.000 |

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| B. Accomplishments/Planned Programs (\$ in Millions) | | | | | |
| | | | | | |
| awareness by reducing the time it takes to gather intelligence data, deliver the intelligence for analysis and to deliver the information to the user. | | | | | |
| FY 2019 Plans: Will conduct risk reduction efforts/experiments to inform decision ahead of CDD | | | | | |
| FY 2020 Base Plans: Will continue risk reduction efforts/experiments based on submitted 1067s and draft CDD | | | | | |
| FY 2020 OCO Plans: N/A | | | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: N/A | | | | | |
| Title: Link 16 Enhancements | | | | | |
| Description: Link 16 Enhancement will develop and field Link 16 Anti Jam (AJ) capabilities on 4th and 5th generation platforms to address Link 16 jamming threats in the contested and highly contested environments. | | | | | |
| FY 2019 Plans: - Will perform non recurring engineering and integration on airborne platforms | | | | | |
| FY 2020 Base Plans: Will conduct development and operational test on integrated solution on airborne platforms | | | | | |
| FY 2020 OCO Plans: N/A | | | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: N/A | | | | | |
| Title: SFF/DACAS Modernization and System-of-Systems (SoS) Enterprise Integration | | | | | |
| Description: This effort will support the development and demonstration of Small Form Factor (SFF) technologies that can support Digitally Assisted Close Air Support (DACAS) and other missions across the full spectrum of operating environments. This effort will consider System-of-Systems (SoS) engineering, technical analysis/performance, platform integration, and Tactics, Techniques, and Procedures (TTPs) to best utilize technologies and acquisition approaches for enterprise modernization. | | | | | |
| | 0.000 | 5.955 | 9.925 | 0.000 | 9.925 |
| | 7.000 | 11.910 | 12.903 | 0.000 | 12.903 |

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| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| will be developed and evaluated for efficacy; recommendations will be identified for appropriate terminal fielding/upgrades to platforms and will be considered when evaluating enterprise TDL capabilities/gaps. | | | | | |
| FY 2019 Plans: - Will complete integrating applique into the MIDS JTRS terminal and conduct various test activities proving out current analysis - Will coordinate with aircraft platforms for integrating and testing applique while utilizing the MIDS JTRS radio and current antennas | | | | | |
| FY 2020 Base Plans: - Will complete analysis to further improve Anti Jam capabilities | | | | | |
| FY 2020 OCO Plans: N/A | | | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: N/A | | | | | |
| Accomplishments/Planned Programs Subtotals | 32.544 | 251.157 | 229.631 | 0.000 | 229.631 |

| C. Other Program Funding Summary (\$ in Millions) | | | | | | | | | | | |
|--|----------------|----------------|---------------------|--------------------|----------------------|----------------|----------------|----------------|----------------|-------------------------|-------------------|
| Line Item | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| • RDTE 07 PE 0207448F: <i>C2/ISR TDL</i> | 2.875 | 1.505 | 1.531 | - | 1.531 | 1.559 | 1.587 | 1.616 | - | Continuing | Continuing |
| • APAF 05 Line Item F01500: <i>F-15</i> | 0.844 | 46.903 | 53.211 | - | 53.211 | 40.167 | 20.933 | 21.310 | - | Continuing | Continuing |
| • APAF 05 Line Item F01600: <i>F-16</i> | - | 6.755 | 8.371 | - | 8.371 | 8.525 | 8.695 | 8.851 | - | Continuing | Continuing |
| • APAF 05 Line Item B00200: <i>B-2A</i> | 1.718 | 2.315 | 0.201 | - | 0.201 | 0.206 | 0.210 | 0.213 | - | Continuing | Continuing |
| • APAF 05 Line Item B01B00: <i>B-1B</i> | - | 0.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | - | Continuing | Continuing |
| • OPAF 03 Line Item 834010: <i>General Information Technology</i> | 0.312 | 0.177 | 0.180 | - | 0.180 | 1.698 | 1.701 | 1.731 | - | Continuing | Continuing |
| Remarks | | | | | | | | | | | |

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D. Acquisition Strategy

The Airborne Networking Directorate provides for common development, integration, and interoperability across the entire airborne network and ensures that data links are procured and maintained as a joint, end-to-end command and control system. Platform acquisition strategies vary by program, but the majority of development and integration is normally accomplished by the weapon system prime contractor.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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|--|--|--|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| TDN Integration | Various | Various : Various | - | 6.971 | Jan 2018 | 61.353 | Jan 2019 | 9.608 | Jan 2020 | - | | 9.608 | Continuing | Continuing | - |
| TDN Integration - TDL PAM | MIPR | Various : Various | - | - | | 28.325 | Feb 2019 | 27.000 | Sep 2020 | - | | 27.000 | Continuing | Continuing | - |
| High Capacity Backbone (HCB) | C/TBD | Various : Various | - | - | | 33.000 | Mar 2019 | 51.000 | Mar 2020 | - | | 51.000 | Continuing | Continuing | - |
| Agile Comms | C/TBD | Various : Various | - | - | | 65.000 | Mar 2019 | 83.000 | Apr 2020 | - | | 83.000 | Continuing | Continuing | - |
| SFF/DACAS Modernization and SoS Enterprise | MIPR | Various : Various | - | 7.000 | Mar 2018 | 11.910 | Mar 2019 | 12.903 | Dec 2019 | - | | 12.903 | Continuing | Continuing | - |
| Applique Technologies for TDLs | MIPR | Various : Various | - | 0.900 | Mar 2018 | 9.131 | Mar 2019 | 5.260 | Mar 2019 | - | | 5.260 | Continuing | Continuing | - |
| Link 16 Evolution | MIPR | Various : Various | - | 8.000 | Mar 2018 | 8.933 | Mar 2019 | - | | - | | - | Continuing | Continuing | - |
| Link 16 Enhancements | C/CPAF | Not specified. : TBD | - | - | | 5.955 | Apr 2019 | 9.925 | Apr 2020 | - | | 9.925 | Continuing | Continuing | - |
| Protected Tactical Waveform (PTW) | C/CPAF | Not specified. : TBD | - | - | | 12.000 | Jun 2019 | 14.888 | Mar 2020 | - | | 14.888 | Continuing | Continuing | - |
| Subtotal | | | - | 22.871 | | 235.607 | | 213.584 | | - | | 213.584 | Continuing | Continuing | N/A |

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---------------------------------|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| TDN Integration - NCCA | C/T&M | MITRE : Bedford, MA | - | 3.202 | Oct 2017 | 1.287 | Oct 2018 | 1.547 | Oct 2019 | - | | 1.547 | Continuing | Continuing | - |
| Subtotal | | | - | 3.202 | | 1.287 | | 1.547 | | - | | 1.547 | Continuing | Continuing | N/A |

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|------------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| TDN Integration - DTF | PO | 46th Test Squadron : Eglin AFB, FL | - | 0.400 | Feb 2018 | 1.222 | Dec 2018 | 2.000 | Nov 2019 | - | | 2.000 | Continuing | Continuing | - |

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604281F / <i>Tactical Data Networks Enterprise</i> | Project (Number/Name) 655050 / <i>TDL System Integration</i> |
|--|--|--|

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| JINTACCS | C/FFP | Spectrum Comm Inc : Newport News, VA | - | 2.985 | Feb 2018 | 6.414 | Feb 2019 | 6.555 | Jan 2020 | - | | 6.555 | Continuing | Continuing | - |
| TDN Integration - AFPTU | MIPR | Various : Various | - | 0.570 | Sep 2018 | 2.077 | Sep 2019 | 2.500 | Dec 2019 | - | | 2.500 | Continuing | Continuing | - |
| 5th to 4th redirect efforts | MIPR | Various : Various | - | 0.635 | | - | | - | | - | | - | Continuing | Continuing | - |
| Subtotal | | | - | 4.590 | | 9.713 | | 11.055 | | - | | 11.055 | Continuing | Continuing | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| TDN Integration PMA - A&AS support - NCCA, Coalition Interoperability, JALN AoA | C/CPAF | Various : Various | - | 1.200 | Jan 2018 | 3.667 | Jun 2019 | 2.000 | Dec 2019 | - | | 2.000 | Continuing | Continuing | - |
| TDN Integration PMA - FFRDC support - Coalition Interoperability, JALN AoA | C/T&M | MITRE : Bedford, MA | - | 0.360 | Oct 2017 | 0.538 | Oct 2018 | 0.600 | Nov 2019 | - | | 0.600 | Continuing | Continuing | - |
| TDN Integration PMA - Travel, Government Purchase Cards, etc...DTF, NCCA, Coalition Interoperability, AFPTU, JALN AoA | Various | Various : Various | - | 0.250 | Sep 2018 | 0.285 | Sep 2019 | 0.800 | Oct 2019 | - | | 0.800 | Continuing | Continuing | - |
| JINTACCS PMA - Travel, Government Purchase Cards, etc... | Various | Various : Various | - | 0.035 | Jan 2018 | 0.060 | Sep 2019 | 0.045 | Oct 2019 | - | | 0.045 | Continuing | Continuing | - |
| Cursor on target - PMA A&AS support | C/Various | Various : . | - | 0.036 | Feb 2018 | - | | - | | - | | - | Continuing | Continuing | - |
| TDL PAM development program | C/CPAF | Various : Various | - | 0.000 | Jan 2018 | - | | - | | - | | - | Continuing | Continuing | - |
| Subtotal | | | - | 1.881 | | 4.550 | | 3.445 | | - | | 3.445 | Continuing | Continuing | N/A |

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force Date: February 2019

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|--|--------------------|----------------|----------------|--|--------------------|----------------------|--|-------------------|---------------------------------|--|
| Appropriation/Budget Activity 3600 / 5 | | | | R-1 Program Element (Number/Name) PE 0604281F / <i>Tactical Data Networks Enterprise</i> | | | Project (Number/Name) 655050 / <i>TDL System Integration</i> | | | |
| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract | |
| Project Cost Totals | - | 32.544 | 251.157 | 229.631 | - | 229.631 | Continuing | Continuing | N/A | |

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604281F / <i>Tactical Data Networks Enterprise</i> | Project (Number/Name) 655050 / <i>TDL System Integration</i> |

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
|--|------------|
| <i>Tactical Data Network Enterprise</i> | |
| TDN Integration | [REDACTED] |
| JINTACCS | [REDACTED] |
| Cursor on Target (CoT) | [REDACTED] |
| TDL Planning, Analysis, and Monitoring (TDL PAM) | [REDACTED] |
| Agile Comms | [REDACTED] |
| High Capacity Backbone (HCB) | [REDACTED] |
| Link 16 Enhancement | [REDACTED] |
| SFF/DACAS Modernization and SoS Enterprise Integration | [REDACTED] |
| Applique Technologies for TDLs | [REDACTED] |
| Link 16 Evolution (changed from "Cognitive Enterprise Development and Baselineing" on FY18 PB) | [REDACTED] |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604281F / <i>Tactical Data Networks Enterprise</i> | Project (Number/Name) 655050 / <i>TDL System Integration</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|---|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Tactical Data Network Enterprise</i> | | | | |
| TDN Integration | 1 | 2018 | 4 | 2023 |
| JINTACCS | 1 | 2018 | 4 | 2023 |
| Cursor on Target (CoT) | 1 | 2018 | 4 | 2018 |
| TDL Planning, Analysis, and Monitoring (TDL PAM) | 2 | 2018 | 4 | 2023 |
| Agile Comms | 1 | 2019 | 4 | 2023 |
| High Capacity Backbone (HCB) | 1 | 2019 | 4 | 2023 |
| Link 16 Enhancement | 1 | 2019 | 4 | 2020 |
| SFF/DACAS Modernization and SoS Enterprise Integration | 2 | 2018 | 4 | 2022 |
| Applique Technologies for TDLs | 2 | 2018 | 4 | 2019 |
| Link 16 Evolution (changed from "Cognitive Enterprise Development and Baselining" on FY18 PB) | 2 | 2018 | 4 | 2020 |

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604281F / <i>Tactical Data Networks Enterprise</i> | Project (Number/Name) 655262 / <i>Family of Gateways</i> |
|--|--|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|-----------------------------------|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| 655262: <i>Family of Gateways</i> | - | 9.584 | 18.858 | 0.000 | 0.000 | 0.000 | 46.246 | 81.212 | 64.646 | 12.810 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

Family of Gateways provides for the study (acquisitions current and proposed), analysis, enhancement, development, integration, costing, demonstration, test, and evaluation efforts that will allow joint combat forces to exchange information quickly and accurately by bridging discrete airborne, terrestrial, maritime, and space-based C4ISR networks producing operational effects not possible within individual networks. Gateway functions include enabling interoperability between data formats, protocols, and communication mediums. Additionally, gateway functions extend the connectivity range, consolidate data from multiple networks into high capacity links for transmission to key C2ISR nodes, route information between disadvantaged users, and fuse/correlate data from multiple sources to improve accuracy. Gateway functions also provide application hosting, shared data storage, on-demand information access, smart data forwarding, and system monitoring and network management. Funding in this project supports 5th-to-4th Generation Communications Capabilities, and 5th-to-5th Generation efforts and future TDL communications development. Additionally, Family of Gateways will support to enhance existing TDL performance, through upgrades and engineering analysis of system designs. Efforts in this project include waveform, ground, and rapid acquisition activities supporting Air Force requirements for communications bridging across multiple platforms, sources and communication domains.

Activities also include studies, analysis, demonstrations and experiments to support both current program planning/execution and future program planning efforts for Family of Gateways.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver TDL weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F and 0605898F.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|--|---------|---------|--------------|-------------|---------------|
| Title: 5th-to-4th Generation Gateway - E-3 AWACS | 9.584 | 4.963 | 0.000 | 0.000 | 0.000 |
| Description: 5th-to-4th Generation Communications Capability facilitates sharing track and sensor data between 5th Generation and 4th Generation aircraft as well as Command and Control (C2) nodes. These capabilities enable interoperability between data formats, protocols, and communication mediums. Additionally, these capabilities extend the connectivity range, consolidate data from multiple networks, domains and sensors into high capacity links for transmission to key C2ISR nodes, route information between disadvantaged users, | | | | | |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604281F / <i>Tactical Data Networks Enterprise</i> | Project (Number/Name) 655262 / <i>Family of Gateways</i> |

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| <p>and correlate data from multiple sources to facilitate early detection and tracking while enabling collaborative targeting. The addition of multi-domain capabilities as a future requirement of the 5th-to-4th Generation Communications Capability enables track sharing at the tactical edge for the timely execution of ground and airborne target sets. These additional capabilities are a combat force multiplier that enhance total force synergy for target prosecution and weapons employment.</p> <p>FY 2019 Plans: -Will begin to develop an acquisition strategy integrating 5th-to-4th Generation Communications Capabilities into the E-3 platforms - Will utilize data/analysis from 5th to 4th UON into the technical package for the RFP being developed for E-3 Program</p> <p>FY 2020 Base Plans: -Will finalize and release RFP for integrating 5th-to-4th Generation Communications Capabilities into the E-3 platforms</p> <p>FY 2020 OCO Plans: N/A</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding decreased due to slow down in development</p> | | | | | |
| <p>Title: BACN Program of Record</p> <p>Description: An Acquisition Decision Memorandum (ADM) was signed 30 March 2018 which establishes the BACN Joint Urgent Operational Need (JUON) as a PoR. This ADM defined the PEO as the Milestone Decision Authority (MDA) and approved entry into the Defense Acquisition System (DAS) as a ACAT III, Post-Milestone C program in the Operations and Support (O&S) phase.</p> <p>FY 2019 Plans: - Will support the development Payload Trainers for the E-11A platforms - Will fund studies to address new technologies and requirements emerge, as well as HMI software and hardware updates</p> <p>FY 2020 Base Plans:</p> | 0.000 | 13.895 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604281F / <i>Tactical Data Networks Enterprise</i> | Project (Number/Name) 655262 / <i>Family of Gateways</i> |

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Will continue to support the BACN Program of Record efforts. | | | | | |
| FY 2020 OCO Plans: N/A | | | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: N/A | | | | | |
| Accomplishments/Planned Programs Subtotals | 9.584 | 18.858 | 0.000 | 0.000 | 0.000 |

| C. Other Program Funding Summary (\$ in Millions) | | | | | | | | | | | |
|--|----------------|----------------|---------------------|--------------------|----------------------|----------------|----------------|----------------|----------------|-------------------------|-------------------|
| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020 Base</u> | <u>FY 2020 OCO</u> | <u>FY 2020 Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To Complete</u> | <u>Total Cost</u> |
| • RDTE 07 PE | 2.875 | 1.505 | 1.531 | - | 1.531 | 1.559 | 1.587 | 1.616 | - | Continuing | Continuing |
| 0207448F: <i>C2ISR TDL</i> | | | | | | | | | | | |
| • APAF 05 Line Item F01500: <i>F-15</i> | 0.844 | 46.903 | 53.211 | - | 53.211 | 40.167 | 20.933 | 21.310 | - | Continuing | Continuing |
| • APAF 05 Line Item F01600: <i>F-16</i> | - | 6.755 | 8.371 | - | 8.371 | 8.525 | 8.695 | 8.851 | - | Continuing | Continuing |
| • APAF 05 Line Item B00200: <i>B-2A</i> | 1.718 | 2.315 | 0.201 | - | 0.201 | 0.206 | 0.210 | 0.213 | - | Continuing | Continuing |
| • APAF 05 Line Item B01B00: <i>B-1B</i> | - | 0.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | - | Continuing | Continuing |
| • OPAF 03 Line Item 834010: | 0.312 | 0.177 | 0.180 | - | 0.180 | 1.698 | 1.701 | 1.731 | - | Continuing | Continuing |
| <i>General Information Technology</i> | | | | | | | | | | | |

Remarks

D. Acquisition Strategy

The Airborne Networking Directorate provides for common development, integration and interoperability across the entire airborne network and ensures that data links are procured and maintained as a joint, end-to-end, command and control system. Platform acquisition strategies vary by program, but the majority of development and integration is normally accomplished by the weapon system prime contractor. Contract approaches vary by program.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604281F / <i>Tactical Data Networks Enterprise</i> | Project (Number/Name) 655262 / <i>Family of Gateways</i> |
|--|--|--|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| 5th to 4th Risk Reduction (UON) | Various | Various : Various | - | 9.584 | Mar 2018 | 0.000 | Mar 2019 | - | | - | | - | Continuing | Continuing | - |
| 5th to 4th Generation Communications Capabilities - E-3 AWACS | TBD | Not specified. : TBD | - | - | | 4.963 | Mar 2019 | 0.000 | | - | | 0.000 | Continuing | Continuing | - |
| BACN Program of Record | TBD | Not specified. : TBD | - | - | | 12.109 | | 0.000 | | - | | 0.000 | Continuing | Continuing | - |
| Subtotal | | | - | 9.584 | | 17.072 | | 0.000 | | - | | 0.000 | Continuing | Continuing | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| 5th To 4th Generation Gateway PMA - Travel, Government Purchase Cards, etc. | Various | Various : Various | - | 0.000 | | - | | - | | - | | - | Continuing | Continuing | - |
| BACN Program of Record | TBD | Not specified. : TBD | - | - | | 1.786 | | - | | - | | - | Continuing | Continuing | - |
| Subtotal | | | - | 0.000 | | 1.786 | | - | | - | | - | Continuing | Continuing | N/A |

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract | |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|-----|
| Project Cost Totals | | - | 9.584 | 18.858 | 0.000 | - | 0.000 | Continuing | Continuing | N/A |

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604281F / <i>Tactical Data Networks Enterprise</i> | Project (Number/Name) 655262 / <i>Family of Gateways</i> |

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
|---|------------|
| 5th-to-4th Generation Gateway | |
| 5th-to-4th Generation Gateway Development | [REDACTED] |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604281F / <i>Tactical Data Networks Enterprise</i> | Project (Number/Name) 655262 / <i>Family of Gateways</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|---|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>5th-to-4th Generation Gateway</i> | | | | |
| 5th-to-4th Generation Gateway Development | 2 | 2018 | 4 | 2023 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0604287F / <i>Physical Security Equipment</i> |
|---|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|--|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 39.639 | 14.421 | 9.700 | 0.000 | 9.700 | 10.066 | 10.276 | 10.462 | 10.650 | Continuing | Continuing |
| 655120: <i>Physical Security Equipment - SD ED</i> | - | 39.639 | 14.421 | 9.700 | 0.000 | 9.700 | 10.066 | 10.276 | 10.462 | 10.650 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

Integrated Base Defense Security Systems (IBDSS) provides improvements and enhancements, demonstrates, and tests Physical Security Equipment (PSE) systems to include Force Protection. This program supports the protection of tactical, fixed, and nuclear weapons systems, AF personnel and AF facilities. The PSE program is organized to provide PSE RDT&E for Air Force specific needs but as a complement to, and in conjunction with, the PSE RDT&E programs funded by the DOD Physical Security Enterprise and Analysis Group (PSEAG). As such this program will obtain, demonstrate, and test PSE in the same manner and to the same standards and architecture as PSEAG-funded projects to ensure interoperability with PSEAG-developed PSE. In support of PSE, this RDT&E program includes spectrum planning for radio frequency (RF), communication security (cyber), information assurance requirements, integration and interoperability command control & communication (3) platform & components. This Program Element also includes funding for Force Protection Commercial Off The Shelf (FP COTS) market research, evaluation and testing. The FP COTS testing applies to all available technologies (delay, denial, detection, assessment, communication display, access control, power, mobility, and defeat effects) which are considered effective for AF physical security use. This program supports the maintenance and test support at Site C 3 and the Cold Weather Test Site (CWTS), as annotated in DoD Directive 3200.11, listing the 46th Test Wing (TW) as a Major Range and Test facility, conducting developmental and operational testing as the primary mission. Force Protection programs are inherently subject to rapid changes in the operational environment and will retain sufficient Program flexibility to meet changes in location, scope and capability in order to protect Air Force people, facilities and warfighting assets.

Counter Small Unmanned Aerial Systems (Cs-UAS) Joint Emergent Operational Need (JEON) is a rapid acquisition and deployment capability existing of full kill (detect, track, assess and defeat with various capabilities (fixed, mobile, portable and hand-held.) It is a layered system-of-systems using COTS technologies, integrated via GOTS C2 system.

Counter Small Unmanned Aerial Systems (Cs-UAS) Joint Urgent Operational Need (JUON) supports EUCOM JUON to protect specific strategic assets in overseas theaters of operation from the evolution of small unmanned aerial systems based on low cost, extensive proliferation, and availability in the commercial marketplace. FY17 is Overseas Contingency Operations (OCO) funding.

Counter Small Unmanned Aerial Systems (Cs-UAS) Joint Urgent Operational Need (JUON) in support of the Combined Joint Task Force - Operations INHERENT RESOLVE in CENTCOM. This funding protects assets from the evolution of small UAS systems based on low cost, extensive proliferation and availability in the current market place.

Counter Small Unmanned Aerial Systems (Cs-UAS) protection capabilities at downward selected high priority sites.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0604287F / <i>Physical Security Equipment</i> |
|---|--|

Counter Small Unmanned Aerial Systems (Cs-UAS) protection capabilities for 7th Air Force Urgent Operational Need (UON)

Air Base Ground Defense (ABGD) will support all Development testing, Evaluation, Integration, Certification, and proof of concept for Tactical Automated Security Systems (TASS) and other tactical/expeditionary equipment that is required to provide robust force protection capabilities worldwide; flight-line security, aircraft, intelligence, surveillance, and reconnaissance assets, critical infrastructure, sustained sortie generation and air operations, advanced technology force multipliers to include: night vision and thermal imagery equipment, counter sniper/battery capabilities, ground weapons, target acquisition radar, inter operable tactical communications, [required C3 and protective standoff equipment for] wheeled tactical [non-tactical], armored [un-armored] vehicles, tactical sensors systems, integrated and interoperable command control & communication (3) platform & components, and unit/personnel protective field equipment. Additionally, ABGD will support all Development testing, Evaluation, Integration, Certification, and proof of concept for Technology Integration Management (TIM) and associated integration and interoperability efforts

This program element may include necessary civilian pay expenses required to manage, execute, and deliver these weapon system capabilities.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 19.739 | 14.421 | 9.700 | 0.000 | 9.700 |
| Current President's Budget | 39.639 | 14.421 | 9.700 | 0.000 | 9.700 |
| Total Adjustments | 19.900 | 0.000 | 0.000 | 0.000 | 0.000 |
| • Congressional General Reductions | -0.011 | -0.029 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 19.900 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | 0.011 | 0.029 | 0.000 | 0.000 | 0.000 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|--|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0604287F / <i>Physical Security Equipment</i> |
|---|--|

| Congressional Add Details (\$ in Millions, and Includes General Reductions) | FY 2018 | FY 2019 |
|---|---------|---------|
| Project: 655120: <i>Physical Security Equipment - SD ED</i> | | |
| Congressional Add: <i>Counter Small Unmanned Aerial Systems (Cs-UAS) Joint Urgent Operational Need (JUON)- EUCOM</i> | 1.000 | 0.000 |
| Congressional Add: <i>Counter Small Unmanned Aerial Systems (Cs-UAS) Joint Urgent Operational Need (JUON) - CENTCOM</i> | 18.900 | 0.000 |
| Congressional Add Subtotals for Project: 655120 | 19.900 | 0.000 |
| Congressional Add Totals for all Projects | 19.900 | 0.000 |

Change Summary Explanation

FY 2018 MDAP Penalty reduction \$0.011M.
 FY 2018 Congressional Add \$19.9M.
 FY 2019 FY 2019 funds include \$0.029M withhold pending final determination of Penalty for Cost Overruns in accordance with PL 114-92 as amended by PL 115-91 section 825(a).

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|---------|---------|---------|
| <p>Title: IBDSS-1</p> <p>Description: IBDSS (Integrated Base Defense Security Systems) qualifies, demonstrates, and tests Physical Security Equipment (PSE) systems to include Force Protection. This continuing effort was previously named Physical Security Equipment.</p> <p>FY 2019 Plans: Includes, but not limited to continuing Force Protection Commercial Off The Shelf (COTS) market research, evaluation and testing to address capability gaps and obsolescence. This includes integration and testing to qualify COTS equipment to provide essential upgrades/improvements and state-of the art technology to support integrated based security systems installations worldwide. Type of technologies includes delay/denial/detection/assessment/communication display/access control/power equipment & systems for IBDSS projects.</p> <p>Continue with previous integrated or modified COTS efforts to improve IBDSS physical security equipment.</p> <p>FY 2020 Plans: N/A</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: IBDSS-1 funding ends in FY19. FY20 is the start of IBDSS-2</p> | 9.239 | 9.421 | 0.000 |
| <p>Title: IBDSS-2</p> | 0.000 | 0.000 | 9.700 |

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|---|--|--|----------------|----------------|
| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | | R-1 Program Element (Number/Name) PE 0604287F / <i>Physical Security Equipment</i> | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| <p>Description: IBDSS-2 (Integrated Base Defense Security Systems) qualifies, demonstrates, and tests Physical Security Equipment (PSE) systems to include Force Protection. This continuing effort was previously named Physical Security Equipment.</p> <p>FY 2019 Plans: Includes, but not limited to continuing Force Protection Commercial Off The Shelf (COTS) market research, evaluation and testing to address capability gaps and obsolescence. This includes integration and testing to qualify COTS equipment to provide essential upgrades/improvements and state-of the art technology to support integrated based security systems installations worldwide. Type of technologies includes delay/denial/detection/assessment/communication display/access control/power equipment & systems for IBDSS projects.</p> <p>Continue with previous integrated or modified COTS efforts to improve IBDSS physical security equipment.</p> <p>FY 2020 Plans: IBDSS (Integrated Base Defense Security Systems) qualifies, demonstrates, and tests Physical Security Equipment (PSE) systems to include Force Protection. This continuing effort was previously named Physical Security Equipment.</p> <p>Includes, but not limited to continuing Force Protection Commercial Off The Shelf (COTS) market research, evaluation and testing to address capability gaps and obsolescence. This includes integration and testing to qualify COTS equipment to provide essential upgrades/improvements and state-of the art technology to support integrated based security systems installations worldwide. Type of technologies includes delay/denial/detection/assessment/communication display/access control/power equipment & systems for IBDSS projects.</p> <p>Continue with previous integrated or modified COTS efforts to improve IBDSS physical security equipment</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY20 is the start of IBDSS-2</p> | | | | |
| <p>Title: Counter Small Unmanned Aerial Systems (Cs-UAS) Joint Emergent Operational Need (JEON) - STRATCOM</p> <p>Description: Counter Small Unmanned Aerial Systems (Cs-UAS) Joint Emergent Operational Need (JEON) is a rapid acquisition and deployment capability existing of full kill (detect, track, assess and defeat with various capabilities (fixed, mobile, portable and hand-held.) It is a layered system-of-systems using COTS technologies, integrated via GOTS C2 system.</p> <p>FY 2019 Plans:</p> | | 9.163 | 0.000 | 0.000 |

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|---|--|--|----------------|----------------|
| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | | R-1 Program Element (Number/Name) PE 0604287F / <i>Physical Security Equipment</i> | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| N/A: no out year funding. FY 2020 Plans: N/A FY 2019 to FY 2020 Increase/Decrease Statement: N/A | | | | |
| Title: Counter Small Unmanned Aerial Systems (Cs-UAS) Urgent Operational Need (UON) - 7th Air Force Description: Delivering rapid acquisition and deployment capability of COTS/GOTS technologies to protect assets from the evolution of counter small unmanned aerial systems (Cs-UAS) in the pacific theater. FY 2019 Plans: N/A: no out year funding. FY 2020 Plans: N/A FY 2019 to FY 2020 Increase/Decrease Statement: N/A | | 1.337 | 0.000 | 0.000 |
| Title: Counter Small Unmanned Aerial System (Cs-UAS) protection capabilities at downward selected high priority sites. Description: Counter Small Unmanned Aerial System (Cs-UAS) protection capabilities at downward selected high priority sites. FY 2019 Plans: Plans include but are not limited to: Development of Medusa cloud computing and distributed support infrastructure, supporting Phase 0 fielding at all AF bases, and continuing to integrate and field COTS/GOTS components to meet C-sUAS requirements. FY 2020 Plans: N/A FY 2019 to FY 2020 Increase/Decrease Statement: N/A | | 0.000 | 5.000 | 0.000 |
| Accomplishments/Planned Programs Subtotals | | 19.739 | 14.421 | 9.700 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|--|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0604287F / <i>Physical Security Equipment</i> |
|---|--|

| | FY 2018 | FY 2019 |
|--|---------|---------|
| Congressional Add: Counter Small Unmanned Aerial Systems (Cs-UAS) Joint Urgent Operational Need (JUON)- EUCOM FY 2018 Accomplishments: Counter Small Unmanned Aerial Systems (Cs-UAS) Joint Urgent Operational Need (JUON) supports EUCOM JUON to protect specific strategic assets in overseas theaters of operation from the evolution of small unmanned aerial systems based on low cost, extensive proliferation, and availability in the commercial marketplace. FY 2019 Plans: N/A: no out year funding.N/A: no out year funding. | 1.000 | 0.000 |
| Congressional Add: Counter Small Unmanned Aerial Systems (Cs-UAS) Joint Urgent Operational Need (JUON) - CENTCOM FY 2018 Accomplishments: Counter Small Unmanned Aerial Systems (Cs-UAS) Joint Urgent Operational Need (JUON) in support of the Combined Joint Task Force - Operations INHERENT RESOLVE in CENTCOM. This funding protects assets from the evolution of small UAS systems based on low cost, extensive proliferation and availability in the current market place. FY 2019 Plans: N/A: no out year funding. | 18.900 | 0.000 |
| Congressional Adds Subtotals | 19.900 | 0.000 |

D. Other Program Funding Summary (\$ in Millions)

| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> | <u>FY 2020</u> | <u>FY 2020</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To</u> | <u>Total Cost</u> |
|---|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-----------------|-------------------|
| | | | <u>Base</u> | <u>OCO</u> | <u>Total</u> | | | | | <u>Complete</u> | |
| • OPAF 03 Line Item 29: <i>Base Physical Security Systems</i> | 166.437 | 92.679 | 76.406 | - | 76.406 | 50.241 | - | - | - | Continuing | Continuing |

Remarks

E. Acquisition Strategy

AFSFC and Force Protection program office investigates requirements to include new and/or obsolete items. COTS sub-systems, equipment and components are competitively acquired from industry after thorough market research. Equipment for testing is purchased via competitive selection processes via direct purchase orders. For security systems COTS that are required to be qualified for nuclear security environments where industry COTS sources may not be mature, consideration is given to replacement of new items or modification of COTS through the competitive selection procedure as well.

Counter Small Unmanned Aerial Systems (Cs-UAS) Joint Emergent Operational Need (JEON). The Force Protection program office is acquiring COTS sub-systems and equipment for DT/OT as well as minor development of an existing C2 System for integration.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force Date: February 2019

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|---|--|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0604287F / <i>Physical Security Equipment</i> |
|---|--|

Counter Small Unmanned Aerial Systems (Cs-UAS) Joint Urgent Operational Need (JUON). The Force Protection program office is acquiring COTS sub-systems and equipment in support of EUCOM JUON for DT/OT as well as minor development of an existing C2 System for integration.

Delivery Orders on Indefinite Delivery/Indefinite Quantity contract vehicles or other approved purchase methods are utilized to acquire equipment.

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|---|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604287F / <i>Physical Security Equipment</i> | Project (Number/Name) 655120 / <i>Physical Security Equipment - SD ED</i> |
|--|--|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Integrated Base Defense Security Systems (IBDSS-1) | Various | Various : Various | - | 1.770 | | 3.513 | | - | | - | | - | Continuing | Continuing | - |
| Integrated Base Defense Security Systems (IBDSS-2) | Various | Various : Various | - | - | | - | | 6.995 | | - | | 6.995 | Continuing | Continuing | - |
| Counter Small Unmanned Aerial Systems (CsUAS) Joint Emergent Operational Need (JEON) STRATCOM | Various | Various : Various | - | 4.017 | | - | | - | | - | | - | Continuing | Continuing | - |
| Counter Small Unmanned Aerial Systems (CsUAS) Joint Urgent Operational Need (JUON) EUCOM | MIPR | Various : Various | - | - | | - | | - | | - | | - | Continuing | Continuing | - |
| Counter Small Unmanned Aerial Systems (CsUAS) Joint Urgent Operational Need (JUON) CENTCOM | Various | Various : Various | - | 13.932 | | - | | - | | - | | - | Continuing | Continuing | - |
| Counter Small Unmanned Aerial System (CsUAS) Urgent Operational Need (UON) 7th Air Force | Various | Various : Various | - | - | | - | | - | | - | | - | Continuing | Continuing | - |
| Counter Small Unmanned Aerial System (Cs-UAS) protection capabilities at downward selected high priority sites | Various | Various : Various | - | - | | 3.579 | | - | | - | | - | Continuing | Continuing | - |
| Subtotal | | | - | 19.719 | | 7.092 | | 6.995 | | - | | 6.995 | Continuing | Continuing | N/A |

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|--|--|--|--|--|--|--|--|--|--|--|---|--|--|--|--|
| Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force | | | | | | | | | | | Date: February 2019 | | | | |
| Appropriation/Budget Activity 3600 / 5 | | | | | | R-1 Program Element (Number/Name) PE 0604287F / <i>Physical Security Equipment</i> | | | | | Project (Number/Name) 655120 / <i>Physical Security Equipment - SD ED</i> | | | | |

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Integrated Base Defense Security Systems (IBDSS-1) | Various | Various : Various | - | 1.975 | | 2.135 | | - | | - | | - | Continuing | Continuing | - |
| Integrated Base Defense Security Systems (IBDSS-2) | Various | Various : Various | - | - | | - | | 1.905 | | - | | 1.905 | Continuing | Continuing | - |
| Counter Small Unmanned Aerial Systems (CsUAS) Joint Urgent Operational Need (JUON) CENTCOM | Various | Various : Various | - | 4.968 | | - | | - | | - | | - | Continuing | Continuing | - |
| Counter Small Unmanned Aerial Systems (CsUAS) Urgent Operational Need (UON) 7th Air Force | MIPR | Various : Various | - | 1.337 | | - | | - | | - | | - | Continuing | Continuing | - |
| Subtotal | | | - | 8.280 | | 2.135 | | 1.905 | | - | | 1.905 | Continuing | Continuing | N/A |

Remarks
The support funding is planned at the above amounts. If the support contracts are less, the available funds will be transitioned to the Product Development line.

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Integrated Base Defense Security Systems (IBDSS-1) | PO | TAC-3 : Eglin, FL | - | 5.495 | | 3.773 | | - | | - | | - | Continuing | Continuing | - |
| Integrated Base Defense Security Systems (IBDSS-2) | Various | Various : Various | - | - | | - | | 0.800 | | - | | 0.800 | Continuing | Continuing | - |
| Counter Small Unmanned Aerial Systems (CsUAS) Joint Emergent Operational Need (JEON) STRATCOM | PO | TAC-3 : Eglin, FL | - | 5.145 | | - | | - | | - | | - | Continuing | Continuing | - |

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|---|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604287F / <i>Physical Security Equipment</i> | Project (Number/Name) 655120 / <i>Physical Security Equipment - SED</i> |
|--|--|---|

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Counter Small Unmanned Aerial Systems (CsUAS) Joint Urgent Operational Need (JUON) EUCOM | PO | Various : Various | - | 1.000 | | - | | - | | - | | - | Continuing | Continuing | - |
| Counter Small Unmanned Aerial Systems (Cs-UAS) protection capabilities at downward selected high priority sites | Various | Various : Various | - | - | | 1.421 | | - | | - | | - | Continuing | Continuing | - |
| Subtotal | | | - | 11.640 | | 5.194 | | 0.800 | | - | | 0.800 | Continuing | Continuing | N/A |
| Project Cost Totals | | | - | 39.639 | | 14.421 | | 9.700 | | - | | 9.700 | Continuing | Continuing | N/A |

Remarks
Various delivery orders will be awarded through out the fiscal year for numerous projects.

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604287F / <i>Physical Security Equipment</i> | Project (Number/Name) 655120 / <i>Physical Security Equipment - SD ED</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>FY19 Events</i> | | | | |
| Integrated Base Defense Security Systems (IBDSS-1) | 1 | 2018 | 4 | 2020 |
| <i>FY20 Events</i> | | | | |
| Integrated Base Defense Security Systems (IBDSS-2) | 1 | 2020 | 4 | 2022 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|--|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0604329F / <i>Small Diameter Bomb (SDB) - EMD</i> |
|---|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---------------------------------|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | 1,098.026 | 37.667 | 78.091 | 31.241 | 0.000 | 31.241 | 17.311 | 27.427 | 27.927 | 28.430 | 0.000 | 1,346.120 |
| 655191: <i>SDB Increment II</i> | 1,098.026 | 37.667 | 78.091 | 31.241 | 0.000 | 31.241 | 17.311 | 27.427 | 27.927 | 28.430 | 0.000 | 1,346.120 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | - | - |

Program MDAP/MAIS Code: 439

A. Mission Description and Budget Item Justification

GBU-53/B Small Diameter Bomb Increment II (SDB II) StormBreaker is a joint interest United States Air Force (USAF) and Department of Navy (DoN) ACAT IC program, with the USAF as the lead service. SDB II addresses the following war-fighter requirements: attack moving and stationary targets, adverse weather operations, multiple kills per pass, multiple ordnance carriage, precision munitions capability, reduced munitions footprint, increased weapons effectiveness, minimized potential for collateral damage, reduced susceptibility of munitions to countermeasures and provides a network enabled weapon capability via Link-16 and Ultra High Frequency (UHF) weapon data link. SDB II is a key component of the Air Force Global Strike Task Force CONOPs. The threshold aircraft for the USAF is the F-15E, and the threshold aircraft for the DoN are the F-35B and F-35C. Objective aircraft include the F-22, F-16, F-35A, B-2, A-10, MQ-9, B-1, B-52, AC-130 and the F/A-18E/F. SDB II is compatible with the Bomb Rack Unit-61 (BRU-61) miniature munitions carriage, Type II carriage systems, the CNU-660/E carriage system, the Common Munitions BIT/Reprogramming Equipment (CMBRE), and the Joint Mission Planning System (JMPS). SDB II will develop and field a single weapon storage container (USAF) and a dual weapon storage container (DoN).

SDB II completed a competitive Risk Reduction in October 2009 and entered Milestone B Engineering and Manufacturing Development (EMD) in August 2010. A Fixed Price Incentive Firm EMD contract with five options for annual Low Rate Initial Production (LRIP) lots (FY15-FY19) was awarded in August 2010. SDB II received Milestone C approval to enter LRIP in June 2015 and completed an Acquisition Program Baseline update. Contract options for LRIP Lots 1-5 have been exercised. Developmental Testing and Evaluation (DT&E), including Guided Test Vehicles (GTV), Live Fire (LF) test missions, and a 28-shot Government Confidence Test (GCT) program was completed. Initial Operational Test and Evaluation (IOT&E) started June 2018 and will complete in May 2019. Initial Operational Capability (IOC) for the F-15E is scheduled for FY2019. IOC on the DoN's F-35B and F-35C is scheduled for FY2021 and FY2022, respectively; and is based on the F-35 B/C hardware and software modification schedule and completion of IOT&E. DoN's first production lot (Lot 4/FY19) supports F/A-18E/F IOC.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver SDB II weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, 0605898F, and 0605833F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|--|---|
| Appropriation/Budget Activity 3600: Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD) | R-1 Program Element (Number/Name) PE 0604329F I Small Diameter Bomb (SDB) - EMD |
|--|---|

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 38.979 | 73.158 | 31.241 | 0.000 | 31.241 |
| Current President's Budget | 37.667 | 78.091 | 31.241 | 0.000 | 31.241 |
| Total Adjustments | -1.312 | 4.933 | 0.000 | 0.000 | 0.000 |
| • Congressional General Reductions | -0.042 | -0.067 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 5.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -1.270 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Congressional Add Details (\$ in Millions, and Includes General Reductions)

Project: 655191: SDB Increment II

Congressional Add: *Precise Navigation*

Congressional Add Subtotals for Project: 655191

Congressional Add Totals for all Projects

| | FY 2018 | FY 2019 |
|--|----------------|----------------|
| | - | 5.000 |
| | - | 5.000 |
| | - | 5.000 |

Change Summary Explanation

FY18 reduced -\$1.270M for Small Business Innovative Research

FY19 Congressional Add for \$5M for Precise Navigation

C. Accomplishments/Planned Programs (\$ in Millions)

Title: SDB II Development and Engineering Changes

Description: Development activities to deliver capabilities in the SDB II Capability Development Document (CDD). Design, develop, integrate, model, test, and qualify engineering changes to SDB II baseline hardware and software to meet emerging threats and to maintain compatibility with external systems. Activities include, but are not limited to, DoD-mandated data link cryptographic modernization, program protection, exportability features, cyber security, advanced guidance, navigation and control, enhanced lethality, precise/advance navigation, and address obsolescence issues and affordability opportunities.

| | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| | 15.346 | 29.065 | 20.148 |

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|--|--|--|----------------|----------------|
| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | | R-1 Program Element (Number/Name) PE 0604329F / <i>Small Diameter Bomb (SDB) - EMD</i> | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| <p>FY 2019 Plans: Complete IOT&E on the F-15E platform. Continue weapon data link cryptographic modernization design reviews, integration, and qualification activities. Build data link cryptographic modernization test assets. Continue collaboration with National Security Agency (NSA) on data link key management. Continue updates for mission planning and operational flight program (OFP) software. Continue development and qualification of engineering changes associated with program protection, exportability, cyber security, enhanced lethality, obsolescence, and affordability.</p> <p>FY 2020 Plans: Complete cryptographic modernization design reviews and continue weapon data link integration and qualification. Conduct activities for production readiness. Continue collaboration with NSA on data link key management. Continue updates for mission planning and OFP software. Continue development, qualification, and begin testing of engineering changes associated with program protection, exportability, cyber security, enhanced lethality, obsolescence, and affordability. Continue integration of SDB II with Command and Control Infrastructure, including Air Operations Center (AOC) integration and Joint Terminal Attack Controller (JTAC) kits. Continue technical order updates to support ongoing OFP development efforts. Continue BRU-61 OFP updates and integration. Increase program office footprint and seating via relocatable, temporary equipment to support workforce and management of programs and security infrastructure upgrades to ensure program schedules are maintained.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding decreased due to building of weapon data link cryptographic modernization test assets.</p> | | | | |
| <p>Title: SDB II Integration and Qualification Testing on F-15E</p> <p>Description: F-15E Aircraft Integration incorporates tests and targets, Modeling and Simulation (M&S), target lethality, data link and mission planning. Develop F-15E OFP upgrades to provide the capability to program the weapon with mission planned targets, weapon data link control, and exclusion zone information prior to launch of the weapon. It also allows the aircrew to make in-flight edits of target and weapon data link programming if/when required based on employment scenarios.</p> <p>FY 2019 Plans: Complete IOT&E on the F-15E platform. Continue OFP update and qualification efforts for the BRU-61. Continue Advanced Joint Effectiveness Model (AJEM) lethality modeling and testing. Continue collaboration with NSA on weapon data link key management software. Continue collaboration with Joint Interoperability Test Command (JITC) on interoperability testing. Continue integration of SDB II with Command and Control Infrastructure, including AOC and integration with JTAC kits. Continue mission planning support during OT. Continue design, development and integration to upgrade SDB II hardware and software to meet emerging threats and to maintain compatibility with external systems (i.e., Cryptographic Modernization, advanced guidance,</p> | | 5.521 | 2.783 | 0.000 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | | R-1 Program Element (Number/Name) PE 0604329F / <i>Small Diameter Bomb (SDB) - EMD</i> | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| navigation and control, ensure exportability, cyber security, and program protection, and address obsolescence issues and affordability opportunities). | | | | |
| FY 2020 Plans: n/a | | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: Funding decreased due to reorganization of major thrust areas to capture appropriate alignment. Integration and test efforts associated with engineering changes and M-Code are now incorporated into the respective major thrust areas. | | | | |
| Title: SDB II M-Code | | 16.800 | 41.243 | 11.093 |
| Description: M-Code is a FY 2011 Congressional mandate. Activities include, but are not limited to, design, development, test and qualification of engineering changes to the SDB II system required for M-Code and enhanced anti-jam capability. M-Code provides an enhanced anti-jam capability and secures access to military GPS signals. M-Code will provide the ability to operate in increasing adversarial anti-access/area-denial (A2/AD) jamming environment with increased accuracy, better signal acquisition, and advanced security. | | | | |
| FY 2019 Plans: Continue activities to provide SDB II with M-Code capabilities for improved anti-jam and secure access to military GPS signals. Complete component and system-level design reviews and continue development, test, and qualification activities for M-Code receiver and associated component integration. Build component and system-level developmental test assets. Update mission planning and threshold aircraft operational flight program (OFP) software to ensure aircraft to weapon integration and transmission of the appropriate M-Code initialization data and crypto keys. | | | | |
| FY 2020 Plans: Continue activities to provide SDB II with M-Code capabilities for improved anti-jam and secure access to military GPS signals. Continue development, test, and qualification activities for M-Code receiver and associated component integration. Continue building developmental test assets. Update mission planning and threshold aircraft OFP software to ensure aircraft to weapon integration and transmission of the appropriate M-Code initialization data and crypto keys. | | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 funding decreased due to the completion of system level design reviews and purchase of component and system-level developmental test assets in FY 2019. FY 2020 funding focuses on integration, qualification and ground test execution. | | | | |
| Accomplishments/Planned Programs Subtotals | | 37.667 | 73.091 | 31.241 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0604329F / <i>Small Diameter Bomb (SDB) - EMD</i> |
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| | | |
|---|----------------|----------------|
| | FY 2018 | FY 2019 |
| Congressional Add: Precise Navigation | - | 5.000 |
| FY 2019 Plans: Conduct developmental activities for precision navigation enhancements. | | |
| Congressional Adds Subtotals | - | 5.000 |

D. Other Program Funding Summary (\$ in Millions)

| Line Item | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|--|---------|---------|-----------------|----------------|------------------|---------|---------|---------|---------|---------------------|------------|
| • MPAF 02 Line Item SDB000: <i>Small Diameter Bomb</i> | 384.250 | - | - | - | - | - | - | - | - | 0.000 | 384.250 |
| • MPAF 02 Line Item SDB002: <i>Small Diameter Bomb II</i> | - | 100.861 | 212.434 | - | 212.434 | 333.546 | 308.116 | 321.972 | 219.598 | 489.974 | 1,986.501 |
| • RDTE 05 PE 0604329N: <i>Small Diameter Bomb II</i> | 57.637 | 72.573 | 73.450 | - | 73.450 | 58.815 | 44.303 | 45.233 | 46.139 | 0.000 | 398.150 |
| • WPN Line Item 223800: <i>Small Diameter Bomb II</i> | 20.968 | 91.272 | 71.077 | - | 71.077 | 68.852 | 70.211 | 71.701 | 73.134 | 301.856 | 769.071 |

Remarks

FY 2018 MPAF 02 Line Item SDB000 includes SDB I and SDB II funding. FY 2019 and out-years includes SDB I funding only.
 FY 2019 and out-years MPAF 02 Line Item SDB002 includes SDB II funding only.
 FY 2018 MPAF 02 Line Item SDB000 includes \$127.220M Overseas Contingency Operation (OCO) for SDB I.
 DoN RDT&E funds include F-35B and F-35C Integration and Support Cost.

E. Acquisition Strategy

The SDB II Engineering and Manufacturing Development (EMD) contract was awarded using competitive procedures. At the completion of the 42-month Risk Reduction phase in October 2009, one contractor was selected in April 2010 and awarded the EMD contract in August 2010. The EMD contract is a Fixed-Price Incentive Firm (FPIF) contract with priced production options for the first five production lots. SDB II production Lots 1-3 are FPIF. Production Lots 4-5 are firm fixed price. The Government is buying the SDB II based on the contractor System Performance Specification (SPS) which has been approved by the Government. The contractor is accountable for system performance as defined in the SPS and a system warranty as defined in the EMD contract and follow-on production contracts. Accordingly, the contractor is accountable to the Government for the design of the weapon system, as well as the planning and execution of the Development Test and Evaluation (DT&E) program to verify system performance. The Government formally arranges and funds the use of Government flight test support for DT&E and OT&E.

In September 2017, the Government awarded a sole source indefinite delivery indefinite quantity (IDIQ) contract to Raytheon Missile Systems to design, develop, integrate, model, test, and qualify engineering changes to SDB II baseline hardware and software to meet emerging threats and to maintain compatibility with external systems. Activities include, but are not limited to M-Code GPS, data link cryptographic modernization, program protection, exportability features, cyber security,

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force Date: February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0604329F / <i>Small Diameter Bomb (SDB) - EMD</i> |
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advanced guidance, navigation and control, enhanced lethality, and address obsolescence issues and affordability opportunities. These SDB II design changes are scheduled to cut into production in FY 2022 (Lot 8).

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604329F / <i>Small Diameter Bomb (SDB)</i> - EMD | Project (Number/Name) 655191 / <i>SDB Increment II</i> |
|--|---|--|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Risk Reduction Contract 1 | C/CPFF | Boeing : St. Louis, MO | 151.922 | - | | - | | - | | - | | - | 0.000 | 151.922 | - |
| Risk Reduction Contract 2 | C/CPFF | Raytheon : Tucson, AZ | 150.800 | - | | - | | - | | - | | - | 0.000 | 150.800 | - |
| EMD Contract | C/FPIF | Raytheon : Tucson, AZ | 460.169 | - | | - | | - | | - | | - | 0.000 | 460.169 | - |
| Engineering Changes & Technical Support | SS/ Various | Raytheon : Tucson, AZ | 92.267 | 15.141 | Feb 2018 | 33.458 | Dec 2018 | 15.735 | Dec 2019 | - | | 15.735 | 21.262 | 177.863 | 136.520 |
| M-Code Integration | SS/ Various | Raytheon : Tucson, AZ | 7.001 | 16.800 | Jan 2018 | 41.243 | Jan 2019 | 11.093 | Mar 2020 | - | | 11.093 | 43.393 | 119.530 | 109.437 |
| IMPACT High Pressure Air Compressor System | SS/FFP | Boeing : St. Charles, MO | 3.175 | - | | - | | - | | - | | - | 0.000 | 3.175 | - |
| F-15E Integration and Test Support | SS/ Various | Boeing : St. Louis, MO | 47.447 | 2.986 | Jun 2018 | 2.000 | Jun 2019 | 2.000 | Jun 2020 | - | | 2.000 | 0.724 | 55.157 | 49.762 |
| BRU-61/A Integration and Test Support | SS/ Various | Boeing : St. Louis, MO | 8.529 | - | | - | | - | | - | | - | 0.000 | 8.529 | - |
| Mission Planning | Various | Various : Various | 5.732 | - | | - | | - | | - | | - | 0.000 | 5.732 | 5.832 |
| Data Link Integration & Support | Various | Various : Various | 3.004 | - | | - | | - | | - | | - | 0.000 | 3.004 | - |
| System Performance & Lethality | Various | Various : Various | 38.688 | 0.262 | Nov 2017 | - | | - | | - | | - | 0.000 | 38.950 | 39.334 |
| Other Product Development | Various | Various : Various | 11.796 | - | | - | | - | | - | | - | 36.791 | 48.587 | 69.594 |
| Subtotal | | | 980.530 | 35.189 | | 76.701 | | 28.828 | | - | | 28.828 | 102.170 | 1,223.418 | N/A |

Remarks
 Engineering Changes: upgrades to SDB II baseline hardware/software to meet emerging threats and to maintain compatibility with external systems. Activities include, but are not limited to, data link cryptographic modernization, program protection, exportability, cyber security, advanced guidance, navigation and control, enhanced lethality, and address obsolescence issues and affordability opportunities.
 Other Product Development: upgrades to baseline hardware/software to support F-35 Integration

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604329F / <i>Small Diameter Bomb (SDB)</i> - EMD | Project (Number/Name) 655191 / <i>SDB Increment II</i> |
|--|---|--|

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---------------------------------|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Other Government Costs | Various | Various : Various | 5.353 | 0.502 | Apr 2018 | 0.521 | Apr 2019 | 0.543 | Apr 2020 | - | | 0.543 | 0.736 | 7.655 | 8.201 |
| Subtotal | | | 5.353 | 0.502 | | 0.521 | | 0.543 | | - | | 0.543 | 0.736 | 7.655 | N/A |

Remarks
Other Gov't Costs: Command & Control Infrastructure Integration subject matter expert (SME) support

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| DT&E: 96th Test Wing | PO | 96th Test Wing : Eglin AFB, FL | 33.538 | 0.872 | Apr 2018 | - | | 1.000 | Dec 2019 | - | | 1.000 | 0.000 | 35.410 | 33.725 |
| DT&E: UTTR, WSMR | Various | Various : Various | 10.304 | - | | - | | - | | - | | - | 0.000 | 10.304 | - |
| Targets | Various | Various : Various | 25.498 | 0.150 | | - | | - | | - | | - | 0.000 | 25.648 | - |
| Other Test Support | Various | Various : Various | 9.263 | - | | - | | - | | - | | - | 0.000 | 9.263 | 11.896 |
| Subtotal | | | 78.603 | 1.022 | | - | | 1.000 | | - | | 1.000 | 0.000 | 80.625 | N/A |

Remarks
UTTR: Utah Test and Training Range
WSMR: White Sands Missile Range

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| EPASS | Various | Various : Eglin AFB, FL | 22.508 | 0.750 | Jun 2018 | 0.750 | Jun 2019 | 0.750 | Jun 2020 | - | | 0.750 | 1.500 | 26.258 | 25.508 |
| Program Management Administration (PMA) | Various | Various : Eglin AFB, FL | 11.032 | 0.204 | Oct 2017 | 0.119 | Oct 2018 | 0.120 | Oct 2019 | - | | 0.120 | 0.264 | 11.739 | 11.536 |
| Subtotal | | | 33.540 | 0.954 | | 0.869 | | 0.870 | | - | | 0.870 | 1.764 | 37.997 | N/A |

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604329F / <i>Small Diameter Bomb (SDB)</i> - EMD | Project (Number/Name) 655191 / <i>SDB Increment II</i> |
|--|---|--|

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |

Remarks
 EPASS: Engineering, Professional & Administrative Support Services
 PMA: Other government costs (travel, GPC, equipment supplies, and IT support)

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|
| Project Cost Totals | 1,098.026 | 37.667 | 78.091 | 31.241 | - | 31.241 | 104.670 | 1,349.695 | N/A |

Remarks

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604329F / <i>Small Diameter Bomb (SDB)</i> - EMD | Project (Number/Name) 655191 / <i>SDB Increment II</i> |

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
|---|--|
| <i>SDB Increment II</i> | |
| DT&E on F-15E | |
| IOT&E on F-15E | |
| F-15E Required Assets Available (RAA) | |
| M-Code Integration & Testing | |
| Data Link Crypto Mod Integration & Testing | |
| Integration & Testing on Threshold F-35B/C | |
| Integration & Test of System Updates to Maintain Interoperability | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604329F / <i>Small Diameter Bomb (SDB)</i> - EMD | Project (Number/Name) 655191 / <i>SDB Increment II</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|---|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>SDB Increment II</i> | | | | |
| DT&E on F-15E | 1 | 2018 | 3 | 2018 |
| IOT&E on F-15E | 3 | 2018 | 3 | 2019 |
| F-15E Required Assets Available (RAA) | 4 | 2019 | 4 | 2020 |
| M-Code Integration & Testing | 1 | 2018 | 4 | 2021 |
| Data Link Crypto Mod Integration & Testing | 1 | 2018 | 4 | 2021 |
| Integration & Testing on Threshold F-35B/C | 1 | 2018 | 4 | 2022 |
| Integration & Test of System Updates to Maintain Interoperability | 4 | 2021 | 4 | 2024 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0604429F / <i>Airborne Electronic Attack</i> |
|---|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|--|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 4.910 | 6.153 | 0.002 | 0.000 | 0.002 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 11.065 |
| 655192: <i>Network & Sys -of-Sys Dev</i> | - | 4.910 | 6.153 | 0.002 | 0.000 | 0.002 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 11.065 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | - | - |

A. Mission Description and Budget Item Justification

The Airborne Electronic Attack (AEA) System of Systems (SoS) project concentrates on the overall systems engineering, modeling and simulation, architecture and network requirements development, effectiveness assessment and requirements allocation to components and component systems of the emerging Electromagnetic Spectrum (EMS) Superiority Enterprise family. Funding supports establishment and use of virtual test capabilities for system of systems effectiveness testing/evaluation for EMS Superiority, instantiating updated Defense Planning Guidance (DPG) scenarios into digital representations suitable for supporting modeling and simulation, conducting studies and technology risk mitigation demonstrations for potential EMS Superiority components and EMS Battle Management, development planning, planning for and supporting OSD or AF directed analysis of alternatives (including working group support), and the development and maintenance of the Air Force electronic warfare capability investment strategy. These efforts are crucial in the development of critical EMS defense and attack capabilities in support of Air Force and joint operations in support of the National Defense Strategy. This project will address and resolve AF gaps/opportunities across the EW/EMS Superiority Enterprise.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver AEA SoS and EMS Superiority Enterprise capabilities. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, 0605898F, and 0605833F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0604429F / <i>Airborne Electronic Attack</i> |
|---|---|

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 7.091 | 7.153 | 0.002 | 0.000 | 0.002 |
| Current President's Budget | 4.910 | 6.153 | 0.002 | 0.000 | 0.002 |
| Total Adjustments | -2.181 | -1.000 | 0.000 | 0.000 | 0.000 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | -2.000 | -1.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -0.181 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Change Summary Explanation

FY 2018 -\$2M Congressional mark for Forward financing

FY 2019 -\$1M Congressional mark for excessive growth

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| Title: AEA System Engineering Studies & Technology Transition | 2.067 | 2.534 | 0.002 |
| Description: Apply systems engineering rigor to analyze and recommend improvements/changes to Air Force Airborne Electronic Attack (AEA) System of Systems (SoS) and Electronic Warfare (EW)/Electromagnetic Spectrum (EMS) Superiority requirements, designs, and operational concepts. Assess operational effectiveness of multiple EMS Superiority systems in both offensive and defensive roles. | | | |
| FY 2019 Plans: Conduct technology demonstrations to provide potential solutions to AF Electronic Support system limitations; update/revise AF EW roadmap as directed by HQ AF; update AF EW capability investment strategy with studies in support of the Air Force Warfighter Integration Capability (AFWIC) Capability Development Plans. | | | |
| FY 2020 Plans: Preparing investment strategy for prototyping and rapid fielding opportunities identified from EW/EMS Superiority ECCT findings. | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: Funding decreased in FY 2020 due to higher level USAF priorities. | | | |
| Title: AEA Capability Planning | 2.843 | 3.619 | 0.000 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0604429F / <i>Airborne Electronic Attack</i> |
|---|---|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| <p>Description: Provide capability planning to the Air Force Electronic Warfare (EW), Airborne Electronic Attack (AEA) System of Systems (SoS) and emerging EW/EMS Superiority portfolio and conduct constructive and virtual modeling and simulation and analysis management.</p> <p>FY 2019 Plans: Complete support to the EW/EMS Superiority ECCT by leveraging preparations for the Joint AEA SoS Analysis of Alternatives (AoA). Report out findings and pursue obtaining resources for effective materiel solutions for AF and joint EMS Superiority capabilities in the 2030+ time frame. Develop acquisition plans to acquire those preferred capabilities for future improved AF EMS Superiority capabilities.</p> <p>FY 2020 Plans: N/A</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding decreased in FY 2020 due to higher level USAF priorities.</p> | | | |
| Accomplishments/Planned Programs Subtotals | 4.910 | 6.153 | 0.002 |

D. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

E. Acquisition Strategy

Plan to use funds on multiple existing IDIQ contracts.

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604429F / Airborne Electronic Attack | Project (Number/Name) 655192 / Network & Sys -of-Sys Dev |
|--|--|--|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| AEA system of systems engineering | C/CPFF | Various : Various | - | 2.067 | Dec 2017 | 2.534 | Dec 2018 | 0.002 | Dec 2019 | - | | 0.002 | Continuing | Continuing | - |
| AF EW Capability/ Development Planning | MIPR | Various : Various | - | 2.520 | Dec 2017 | 3.219 | Dec 2018 | - | | - | | - | 0.000 | 5.739 | - |
| Subtotal | | | - | 4.587 | | 5.753 | | 0.002 | | - | | 0.002 | Continuing | Continuing | N/A |

Remarks
Includes system of systems engineering; architecture development; network requirements planning; requirements refinement and development; EW assessments, including Air Force Electronic Warfare Capability Investment Strategy (AFEWCIS) roadmap development, maintenance & assessments; technology risk mitigation, DoD scenario initiation & distribution; conduct of Joint AoA (working group support and organic civilian salaries); engineering and test planning; capability planning for AF EW portfolio; conduct of constructive/virtual modeling simulation and analysis.

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Mission Support | Various | Various : Various | - | 0.323 | Dec 2017 | 0.400 | Dec 2018 | - | | - | | - | 0.000 | 0.723 | - |
| Subtotal | | | - | 0.323 | | 0.400 | | - | | - | | - | 0.000 | 0.723 | N/A |

Remarks
Element includes miscellaneous support to projects. Costs include travel and unique security expenses.

| Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--------------------|----------------|----------------|---------------------|--------------------|----------------------|-------------------------|-------------------|---------------------------------|
| - | 4.910 | 6.153 | 0.002 | - | 0.002 | Continuing | Continuing | N/A |

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|--|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604429F / Airborne Electronic Attack | Project (Number/Name) 655192 / Network & Sys -of-Sys Dev |
|--|--|--|

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|--|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| <i>Airborne Electronic Attack</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| DoD Planning Scenarios Suppressor updates | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Continuing to Support EW Assessments | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| AEA SoS Suppressor Improvements | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| AF EW Investment Strategy | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Conduct Joint AEA Development and Planning | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604429F / <i>Airborne Electronic Attack</i> | Project (Number/Name) 655192 / <i>Network & Sys -of-Sys Dev</i> |
|--|---|---|

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Airborne Electronic Attack</i> | | | | |
| DoD Planning Scenarios Suppressor updates | 1 | 2018 | 4 | 2019 |
| Continuing to Support EW Assessments | 1 | 2018 | 2 | 2020 |
| AEA SoS Suppressor Improvements | 1 | 2018 | 4 | 2019 |
| AF EW Investment Strategy | 1 | 2018 | 4 | 2019 |
| Conduct Joint AEA Development and Planning | 1 | 2018 | 4 | 2019 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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|---|--|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0604602F / <i>Armament/Ordnance Development</i> |
|---|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|--|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 16.765 | 49.590 | 28.043 | 0.000 | 28.043 | 6.197 | 6.597 | 6.717 | 6.838 | Continuing | Continuing |
| 653133: <i>Bombs & Fuzes</i> | - | 11.276 | 44.692 | 19.054 | 0.000 | 19.054 | 1.122 | 1.416 | 1.442 | 1.468 | Continuing | Continuing |
| 655361: <i>Stores-Aircraft Interface</i> | - | 5.489 | 4.898 | 8.989 | 0.000 | 8.989 | 5.075 | 5.181 | 5.275 | 5.370 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

The Armament Ordnance Development program provides for the initial and continuing development of weapons, munitions, and munitions equipment for aircraft integration, support, and operational use. This program also provides for the development and integration of advanced position, navigation, and timing (PNT) capabilities (i.e. GPS, non-GPS, optical, passive, active, etc.). This program develops, characterizes, and improves current, future, and legacy munitions, ammunitions, and subsystems.

653133: The Bombs & Fuzes project improves conventional weapons/munitions (kinetic and non-kinetic), fuzes, and height-of-burst sensors (HOBS), and develops and integrates complementary position, navigation, and timing (PNT) capabilities (i.e. GPS, non-GPS, optical, passive, active, etc.). This project also provides an opportunity to quickly insert emerging technologies into existing and developing aircraft munitions and fuzes. Bombs & Fuzes provides research, development, and testing of conventional warheads, fuzing, HOBS modifications, and anti-personnel anti-materiel (APAM) weapons to improve lethality against area, mobile, hard and deeply buried, and fixed targets. This project provides for the development and testing necessary to provide a suitable manufacturing base of conventional warheads, fuzes, HOBS, and munitions materiel handling equipment (MMHE).

In FY2019, Joint Air-to-Ground Missile for Fixed Wing (JAGM-F) was a new start.

655361: The Stores-Aircraft Interface project conducts stores-aircraft interface upgrades and standards development to include the Universal Armament Interface (UAI). UAI is an Air Force initiative to develop standardized software interfaces in aircraft weapons and mission planning. The savings realized from this effort is on average 6 years of schedule and \$22M per aircraft/weapon combination. This is accomplished by enabling integration of weapons independent of aircraft Operational Flight Programs (OFF) cycles. UAI is currently implemented on the F-15E, F-16 Block 40/50 and European Participating Air Forces (EPAF) F-16 aircraft, Small Diameter Bomb (SDB) I and II, Joint Direct Attack Munition (JDAM), Laser JDAM, Joint Air-to-Surface Stand-off Missile (JASSM), and Precision Guided Munitions Planning Software (PGMPS). Planned implementation include Joint Strike Fighter (JSF/F-35), B-21, MQ-9, JASSM-Extended Range (JASSM-ER), F/A-18, Advanced Anti-Radiation Guided Missile - Extended Range (AARGM-ER), Combat Weapons Delivery Software (CWDS), SPEAR3, Joint Strike Missile (JSM), and the Turkish Stand Off Missile - Joint (SOM-J). The UAI program office is responsible for development and enhancement of the standard, support to coalition/allied/joint interoperability efforts for weapons-platform interface, provision of certification tools, and implementation support to aircraft and weapons.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver Armament/Ordnance Development weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, 0605898F, and 0605833F.

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0604602F / <i>Armament/Ordnance Development</i> |
|---|--|

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 46.540 | 58.590 | 13.043 | 0.000 | 13.043 |
| Current President's Budget | 16.765 | 49.590 | 28.043 | 0.000 | 28.043 |
| Total Adjustments | -29.775 | -9.000 | 15.000 | 0.000 | 15.000 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | -32.092 | -9.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 2.793 | 0.000 | | | |
| • SBIR/STTR Transfer | -0.476 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 15.000 | 0.000 | 15.000 |

Change Summary Explanation

FY 2018, decrease of \$32.092M for Sensor Fuzed Weapon-ER, BPAC 651033.

FY 2018, reprogrammed \$2.000M to BLU-134/B and \$0.794M to Universal Armament Interface (UAI).

FY 2019, decrease of \$9.000M for JAGM-F.

FY 2020, increase of \$11.000M for JAGM-F.

FY 2020, increase of \$4.000M for UAI.

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|---|--------------------|----------------|----------------|---------------------|--|----------------------|----------------|----------------|---|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 5 | | | | | R-1 Program Element (Number/Name) PE 0604602F / <i>Armament/Ordnance Development</i> | | | | Project (Number/Name) 653133 / <i>Bombs & Fuzes</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 653133: <i>Bombs & Fuzes</i> | - | 11.276 | 44.692 | 19.054 | 0.000 | 19.054 | 1.122 | 1.416 | 1.442 | 1.468 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

The Bombs & Fuzes project improves conventional weapons/munitions (kinetic and non-kinetic), fuzes, and height-of-burst sensors (HOBS), and develops and integrates complementary position, navigation, and timing (PNT) capabilities (i.e. GPS, non-GPS, optical, passive, active, etc.). This project also provides an opportunity to quickly insert emerging technologies into existing and developing aircraft munitions and fuzes. Bombs & Fuzes provides research, development, and testing of conventional warheads, fuzing, HOBS modifications, and anti-personnel anti-materiel (APAM) weapons to improve lethality against area, mobile, hard and deeply buried, and fixed targets. This project provides for the development and testing necessary to provide a suitable manufacturing base of conventional warheads, fuzes, HOBS, and munitions materiel handling equipment (MMHE).

- Munitions Materiel Handling Equipment (MMHE): MMHE is a continuing project to develop and improve the standardization and commonality of munitions handling and armament equipment to preclude duplication. Efforts are primarily the study, design, and development of MMHE and armament control systems; however, support may be provided to other functional areas as requested. Procurement will be performed and funded by the applicable weapons system project.

- Medium Caliber Ammunition project assesses, refines, and develops medium caliber ammunition, to include, but not limited to, conducting 25mm (F-35) qualification testing, comparative testing, and mitigating ammunition inventory health issues.

- Insensitive Munitions (IM) project supports AF IM strategic planning to achieve IM compliance IAW U.S. Code, Title 10, Subtitle A, Part N, Chapter 141, Section 2389, ensuring safety regarding insensitive munitions. Models and validates munition performance, integrates less sensitive explosive fills, addresses IM explosive fill deficiencies, and develops bomb case modifications to improve the response of conventional weapons to unplanned stimuli. This project explores and develops IM solutions.

- Next Generation Area Attack Weapons (NGAAWs) are a family of unitary area attack weapon capabilities to meet the DoD policy regarding cluster munitions and unintended harm to civilians. They consist of BLU-134/B and BLU-136/B warheads with a height of burst sensor. BLU-134/B Improved Lethality Warhead (ILW), NGAAW Increment I, is a near-term solution for area attack as an anti-personnel anti-materiel (APAM) weapon that improves lethality using a 500 lb warhead design and any variants. The BLU-136/B NGAAW Increment II continues development to provide significantly increased capability and lethality against area targets as an APAM weapon. This effort is being executed using an accelerated acquisition strategy to study, design, develop, and test a 2,000 lb unitary warhead design and any variants based on target sets.

- Cockpit-selectable Height-Of-Burst Sensor (C-HOBS): The C-HOBS sensor will be a replacement for the current DSU-33D/B proximity sensor. C-HOBS will replace the single factory height-of-burst setting with the addition of multiple height-of-burst options selectable via both manual switches and a cockpit interface. These selection

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | Date: February 2019 |
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|--|--|---|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604602F / <i>Armament/Ordnance Development</i> | Project (Number/Name) 653133 / <i>Bombs & Fuzes</i> |
|--|--|---|

options allow flexibility during flight to address a wide array of targets. The C-HOBS is intended to interface with and provide a cockpit-selectable proximity function to general and special purpose weapons.

- Joint Air-to-Ground Missile for Fixed Wing Aircraft (JAGM-F) is an improvement to the Army-led JAGM which will allow the missile to be released from fixed wing aircraft in order to eliminate time sensitive moving targets and high value covered/sheltered targets. JAGM-F will be able to combat adverse weather/low visibility battlefield and countermeasure environments as well as austere communication environments. JAGM-F will have the ability to engage multiple target types near-simultaneously in multiple engagement modes. Efforts include but are not limited to testing, qualification, and design/build demo components to production standards. Intent is to investigate meeting all BRU-55, BRU-57, and BRU-61 environments.

In FY2019, Joint Air-to-Ground Missile for Fixed Wing (JAGM-F) was a new start.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|--|---------|---------|--------------|-------------|---------------|
| <p>Title: Munitions Materiel Handling Equipment (MMHE)</p> <p>Description: Armament Standardization/Control/Munitions Materiel Handling Equipment (MMHE) is a continuing project to develop and improve the standardization and commonality of munitions handling and armament equipment to preclude duplication. Efforts are primarily the study, design, and development of MMHE and armament control systems; however, support may be provided to other functional areas as requested. Procurement will be performed and funded by the applicable weapons system project.</p> <p>FY 2019 Plans: Complete 20 MMHE support equipment projects to include engineering, drafting, proof load, technical data, and safety authorizations. Fabricate 15 prototypes for test and evaluation purposes. Complete 15 first article equipment fabrications for drafting verification and delivery to Air Force units for additional test and evaluation. Provide support to all system program offices with new weapons and aircraft configurations, as needed. Continue support to the F-35 program with equipment to aid safe munitions loading and handling of various pylons and adapters. Continue to support the B-21 program office with evaluations and recommendations for equipment to aid safe munitions loading and handling of various pylons and adapters. Continue support to DARPA with designs and manufacturing of equipment to aid safe munitions loading and handling of Hypersonic weapons. Continue support and sustainment of all previously existing items developed by the MMHE program office. Continue to provide MMHE Sustainment office at Robins AFB with engineering support.</p> <p>FY 2020 Base Plans: Complete MMHE support projects to include engineering, drafting, proof load, technical data, and safety authorizations. Fabricate prototypes for test and evaluation purposes. Complete first article equipment fabrications for drafting verification and delivery to Air Force units for additional test and evaluation. Provide</p> | 0.932 | 0.696 | 0.714 | - | 0.714 |

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604602F / <i>Armament/Ordnance Development</i> | Project (Number/Name) 653133 / <i>Bombs & Fuzes</i> |
|--|--|---|

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|---------|---------|--------------|-------------|---------------|
| <p>support to all system program offices with new weapons and aircraft configurations, as needed. Continue support to the F-35 program with equipment to aid safe munitions loading and handling of various pylons and adapters. Continue to support the B-21 program office with evaluations and recommendations for equipment to aid safe munitions loading and handling of various pylons and adapters. Continue support to DARPA with designs and manufacturing of equipment to aid safe munitions loading and handling of hypersonic weapons. Continue support for Air Force Research Laboratory on future munition concept demonstrators. Continue support and sustainment of all previously existing items developed by the MMHE program office. Continue to provide MMHE Sustainment office at Robins AFB with engineering support.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding increased due to increase in MMHE projects.</p> | | | | | |
| <p>Title: Medium Caliber Ammunition</p> <p>Description: The Medium Caliber Ammunition efforts support the warfighter's medium caliber ammunition research, development, test, and evaluation (RDT&E) requirements, DoN/USAF collaboration for the medium caliber family of ammunition, foreign comparative testing, inventory health challenges, procurement of ammunition, and other emerging technologies.</p> <p>FY 2019 Plans: Provide engineering and technical support for PGU-48/B rounds as well as further comparative testing and engineering & manufacturing development (EMD) of alternative products/sources. Assess and mitigate Medium Caliber ammunition inventory health challenges.</p> <p>FY 2020 Base Plans: Continue to provide engineering and technical support for PGU-48/B rounds as well as further comparative testing/EMD of alternative products/sources. Initiate development of the 30mm replacement round. Assess and mitigate Medium Caliber ammunition inventory health challenges.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: N/A</p> | 0.200 | 0.100 | 0.100 | - | 0.100 |
| <p>Title: Insensitive Munitions (IM)</p> <p>Description: Model and validate munition performance; assess and correct IM deficiencies; explore and develop new IM technology; conduct strategic IM planning for the AF; support Joint Service IM efforts; provide technical guidance and test expertise to AF IM programs.</p> | 0.300 | 0.300 | 0.300 | - | 0.300 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604602F / <i>Armament/Ordnance Development</i> | Project (Number/Name) 653133 / <i>Bombs & Fuzes</i> |

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| <p>FY 2019 Plans: Execute the Insensitive Munitions Strategic Plan (IMSP) and Plan of Action and Milestones (POAM). Model and validate munition performance; support DoD and Joint Service IM planning; provide IM planning expertise to individual AF programs and continue to improve, characterize, and integrate less sensitive explosive fills; assess and correct identified IM explosive fill deficiencies; and develop bomb case modifications to improve the response of conventional weapons to unplanned stimuli.</p> <p>FY 2020 Base Plans: Execute the Insensitive Munitions Strategic Plan (IMSP) and Plan of Action and Milestones (POAM). Begin Phase II of the Liner project for the BLU-117 which includes engineering passive venting using IM features. Once features are implemented, qualification testing will take place.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: N/A</p> | | | | | |
| <p>Title: BLU-136/B Next Generation Area Attack Weapon Increment II</p> <p>Description: The Next Generation Area Attack Weapon Increment II (NGAAW II) continues development of anti-personnel anti-materiel (APAM) weapons to improve lethality against area targets via an accelerated acquisition strategy. This effort studies, designs, develops, and tests a warhead design and any variants which significantly improve lethality against APAM while meeting current DoD policy on cluster munitions and unintended harm to civilians.</p> <p>FY 2019 Plans: N/A</p> <p>FY 2020 Base Plans: N/A</p> | 8.718 | 0.000 | 0.000 | - | 0.000 |
| <p>Title: BLU-134/B Improved Lethality Warhead (ILW), Next Generation Area Attack Weapon Inc I</p> <p>Description: This Next Generation Area Attack Weapon (NGAAW Inc I), formerly known as Improved Lethality (IL), continues and expands development planning and legacy warhead efforts in designing anti-personnel anti-materiel (APAM) weapons to improve lethality against area targets. This effort studies, designs, develops, and tests warhead and fuzing modifications which improve lethality against area targets while meeting current</p> | 0.331 | 0.000 | 0.000 | - | 0.000 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | Date: February 2019 | |
| Appropriation/Budget Activity 3600 / 5 | | R-1 Program Element (Number/Name) PE 0604602F / <i>Armament/Ordnance Development</i> | | Project (Number/Name) 653133 / <i>Bombs & Fuzes</i> | |
| B. Accomplishments/Planned Programs (\$ in Millions) | | | | | |
| | | | | | |
| DoD policy on cluster munitions and unintended harm to civilians. These improvements may be synergistic with maintaining a suitable manufacturing base. | | | | | |
| FY 2019 Plans: N/A | | | | | |
| FY 2020 Base Plans: N/A | | | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: N/A | | | | | |
| Title: Cockpit-Selectable Height-Of-Burst Sensor (C-HOBS) | | | | | |
| Description: Cockpit-selectable Height-Of-Burst Sensor (C-HOBS). The C-HOBS sensor will be a replacement for the legacy DSU-33D/B proximity sensor. C-HOBS will replace the single factory height-of-burst setting with the addition of multiple height-of-burst options selectable via both manual switches and a cockpit interface. These selection options allow flexibility during flight to address a wide array of targets. The C-HOBS is intended to interface with the weapon via the cockpit and provide a cockpit-selectable proximity function for general and special purpose weapons. | | | | | |
| FY 2019 Plans: Continue design and development effort; design and initial qualification tests; and integration work. Conduct government/industry reviews working towards completion of Milestone B efforts. Evaluate production representative articles and prepare Initial Product Baseline and Product Support Plan. Initiate a CDR Assessment based on test results for the Milestone Decision Authority (MDA) in preparation of a LRIP Production Decision in FY20 with a Full Rate Production Decision in FY21. | | | | | |
| FY 2020 Base Plans: Continue to mature development; design and qualification tests; and integration work. Conduct government/industry reviews working towards completion of Milestone B efforts. Evaluate production representative articles and complete Initial Product Baseline and Product Support Plan. Complete a CDR Assessment based on test results for the Milestone Decision Authority (MDA) in preparation of a LRIP Production Decision with a Full Rate Production Decision in FY21. | | | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: | | | | | |
| | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
| | 0.795 | 21.000 | 6.940 | - | 6.940 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604602F / <i>Armament/Ordnance Development</i> | Project (Number/Name) 653133 / <i>Bombs & Fuzes</i> |

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Funding decreased due to ramp down in development efforts. | | | | | |
| Title: Joint Air-to-Ground Missile for Fixed Wing (JAGM-F) | 0.000 | 22.596 | 11.000 | 0.000 | 11.000 |
| Description: Joint Air-to-Ground Missile for Fixed Wing Aircraft (JAGM-F) is an improvement to the Army-led JAGM which will allow the missile to be released from fixed wing aircraft in order to eliminate time sensitive moving targets and high value covered/sheltered targets. JAGM-F will be able to combat adverse weather/low visibility battlefield and countermeasure environments as well as austere communication environments. JAGM-F will have the ability to engage multiple targets types near-simultaneously in multiple engagement modes. Efforts include but are not limited to testing, qualification, and design/build demo components to production standards. Intent is to investigate meeting all BRU-55, BRU-57, and BRU-61 environments. | | | | | |
| FY 2019 Plans: Model the design and build, Jettison and Capture Analysis, Mechanical Design, Electronic Design and Testing, Electrical Packaging, software design and code development, weapons system integration, aircraft systems integration, test vehicle design and build, and test vehicle flight planning. | | | | | |
| FY 2020 Base Plans: Continue to model the design and build, Jettison and Capture Analysis, Mechanical Design, Electronic Design and Testing, Electrical Packaging, software design and code development, weapons system integration, aircraft systems integration, test vehicle design and build, and test vehicle flight planning. Purchase additional government furnished equipment (GFE) and flight test support. | | | | | |
| FY 2020 OCO Plans: N/A | | | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: Funding decreased due to ramp down in development efforts. | | | | | |
| Accomplishments/Planned Programs Subtotals | 11.276 | 44.692 | 19.054 | 0.000 | 19.054 |

| C. Other Program Funding Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|----------------|----------------|---------------------|--------------------|----------------------|----------------|----------------|----------------|----------------|-------------------------|-------------------|
| • PAAF 01 Line Item 353020: <i>General Purpose Bombs</i> | 341.501 | 811.170 | 0.000 | 631.194 | 631.194 | 1,106.037 | 896.535 | 905.658 | 484.254 | Continuing | Continuing |
| • PAAF 01 Line Item 356120: <i>Fuzes</i> | 60.369 | 180.691 | 0.000 | 158.889 | 158.889 | 226.259 | 163.565 | 168.021 | 140.557 | Continuing | Continuing |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604602F / <i>Armament/Ordnance Development</i> | Project (Number/Name) 653133 / <i>Bombs & Fuzes</i> |
|--|--|---|

C. Other Program Funding Summary (\$ in Millions)

| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> <u>Base</u> | <u>FY 2020</u> <u>OCO</u> | <u>FY 2020</u> <u>Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To</u> <u>Complete</u> | <u>Total Cost</u> |
|--|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|
| • PAAF 01 Line Item 352010: <i>Cartridges</i> | 205.853 | 188.227 | 0.000 | 193.091 | 193.091 | 186.551 | 171.852 | 168.021 | 149.779 | Continuing | Continuing |

Remarks

D. Acquisition Strategy

- Fuzes (including C-HOBS) is a continuing effort with most activities performed through contracted services.
- Munitions Materiel Handling Equipment (MMHE) project activities are performed in-house with limited technical and analysis contract support.
- Medium Caliber Ammunition project activities are performed in-house with technical and analysis contract support, organic government test support, and possible contracted services (small contracts).
- Insensitive Munitions project activities are performed in-house with limited technical and analysis contract support.
- The BLU-136/B NGAAW Inc II warhead design program will implement an accelerated acquisition program strategy. This strategy includes rapid development and prototyping of a warhead design resulting in a final, validated Technical Data Package (TDP). The TDP will be used to compete for initial production and follow on procurement to meet the warfighter requirement. The NGAAW program will continue to evaluate product improvements.
- Joint Air-to-Ground Missile for Fixed Wing Aircraft (JAGM-F) will utilize the Defense Ordnance Technology Consortium (DOTC) contract combined with modeling and simulation contract support and government test support.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604602F / <i>Armament/Ordnance Development</i> | Project (Number/Name) 653133 / <i>Bombs & Fuzes</i> |
|--|--|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| IM | Various | Various : TBD | - | 0.300 | Mar 2018 | 0.300 | Mar 2019 | 0.300 | Mar 2020 | - | | 0.300 | Continuing | Continuing | - |
| MMHE - Prototypes | Various | Prototype Fabrication Shop : Eglin AFB, FL | - | 0.322 | Apr 2018 | 0.086 | Apr 2019 | 0.134 | Apr 2020 | - | | 0.134 | Continuing | Continuing | - |
| BLU-134/B / BLU-136 ILW - NGAAW Concept Development | Various | Various : Eglin AFB, FL | - | 4.703 | Aug 2018 | - | | - | | - | | - | Continuing | Continuing | - |
| CHOBS - HW/SW | C/Various | Various : Eglin AFB, FL | - | 0.500 | Jan 2019 | 16.385 | Mar 2019 | 3.440 | Dec 2019 | - | | 3.440 | Continuing | Continuing | - |
| JAGM-F | C/FFP | DOTC : Huntsville, AL | - | 0.000 | | 20.217 | Feb 2019 | 7.396 | Oct 2019 | 0.000 | | 7.396 | Continuing | Continuing | - |
| Subtotal | | | - | 5.825 | | 36.988 | | 11.270 | | 0.000 | | 11.270 | Continuing | Continuing | N/A |

Remarks
NGAAW concept development continues.

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|-------------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| MMHE - Shipping/Supplies | Various | MMHE Program Office : Eglin AFB, FL | - | 0.130 | Mar 2018 | 0.130 | Mar 2019 | 0.130 | Mar 2020 | - | | 0.130 | Continuing | Continuing | - |
| JAGM-F - Government Furnished Equipment | C/TBD | Army : Huntsville, AL | - | - | | 0.560 | Apr 2019 | 1.549 | Dec 2019 | - | | 1.549 | Continuing | Continuing | - |
| Subtotal | | | - | 0.130 | | 0.690 | | 1.679 | | - | | 1.679 | Continuing | Continuing | N/A |

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| BLU-134/B / BLU-136 ILW - Test and Evaluation | PO | Various : Various | - | 3.525 | Aug 2018 | - | | - | | - | | - | Continuing | Continuing | 6.530 |

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604602F / <i>Armament/Ordnance Development</i> | Project (Number/Name) 653133 / <i>Bombs & Fuzes</i> |
|--|--|---|

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| CHOBS - Test and Evaluation | C/Various | Various : Various | - | - | | 2.700 | Mar 2019 | 3.000 | Jul 2020 | - | | 3.000 | Continuing | Continuing | - |
| MMHE - Test Support | PO | 96 TW : Eglin AFB, FL | - | 0.040 | Apr 2018 | 0.040 | Apr 2019 | 0.050 | Nov 2019 | - | | 0.050 | Continuing | Continuing | - |
| JAGM-F - Test Support | PO | Various : Various | - | - | | 1.489 | Mar 2019 | 1.624 | Dec 2019 | - | | 1.624 | Continuing | Continuing | - |
| Subtotal | | | - | 3.565 | | 4.229 | | 4.674 | | - | | 4.674 | Continuing | Continuing | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Medium Caliber - PMA | Various | Various : Eglin AFB, FL | - | 0.200 | Jun 2018 | 0.100 | Jun 2019 | 0.100 | Jun 2020 | - | | 0.100 | Continuing | Continuing | - |
| MMHE - PMA | Various | Various : Eglin AFB, FL | - | 0.440 | Jun 2018 | 0.440 | Jun 2019 | 0.400 | Jun 2020 | - | | 0.400 | Continuing | Continuing | - |
| BLU-134/B / BLU-136/B - PMA | Various | Various : NV | - | 0.821 | Jul 2018 | - | | - | | - | | - | Continuing | Continuing | - |
| CHOBS - PMA | Various | Various : Eglin AFB, FL | - | 0.295 | Jul 2018 | 1.915 | Oct 2018 | 0.500 | Oct 2019 | - | | 0.500 | Continuing | Continuing | - |
| JAGM-F - PMA | Various | Various : Eglin AFB, FL | - | - | | 0.330 | Mar 2019 | 0.431 | Oct 2019 | - | | 0.431 | Continuing | Continuing | - |
| Subtotal | | | - | 1.756 | | 2.785 | | 1.431 | | - | | 1.431 | Continuing | Continuing | N/A |

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|
| Project Cost Totals | | - | 11.276 | 44.692 | 19.054 | 0.000 | Continuing | Continuing | N/A |

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|---|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604602F / <i>Armament/Ordnance Development</i> | Project (Number/Name) 653133 / <i>Bombs & Fuzes</i> |
|--|--|---|

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| <i>Bombs and Fuzes</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Munitions Materiel Handling Equipment (MMHE): design, prototype, test priority MMHE projects | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Execute IMSP POAM | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BLU-134/B ILW Mold Design, Build, Test | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BLU-136/B- Warhead Design / Initial Prototype | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CHOBBS - RFP/Contract Prep/Source Selection | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CHOBBS - Contract Award | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CHOBBS - Design, Build, Test, and Integration | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Medium Caliber Ammunition: Assess, refine and develop medium caliber ammunition | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| JAGM-F - Contract Award | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| JAGM-F - Design, Build, Test, and Integration | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604602F / <i>Armament/Ordnance Development</i> | Project (Number/Name) 653133 / <i>Bombs & Fuzes</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Bombs and Fuzes</i> | | | | |
| Munitions Materiel Handling Equipment (MMHE): design, prototype, test priority MMHE projects | 1 | 2018 | 4 | 2024 |
| Execute IMSP POAM | 1 | 2018 | 4 | 2024 |
| BLU-134/B ILW Mold Design, Build, Test | 1 | 2018 | 3 | 2018 |
| BLU-136/B- Warhead Design / Initial Prototype | 1 | 2018 | 4 | 2019 |
| CHOBS - RFP/Contract Prep/Source Selection | 1 | 2018 | 2 | 2019 |
| CHOBS - Contract Award | 2 | 2019 | 2 | 2019 |
| CHOBS - Design, Build, Test, and Integration | 2 | 2019 | 2 | 2021 |
| Medium Caliber Ammunition: Assess, refine and develop medium caliber ammunition | 1 | 2018 | 4 | 2024 |
| JAGM-F - Contract Award | 2 | 2019 | 2 | 2019 |
| JAGM-F - Design, Build, Test, and Integration | 2 | 2019 | 4 | 2021 |

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|---|--------------------|----------------|----------------|---------------------|--|----------------------|----------------|----------------|---|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 5 | | | | | R-1 Program Element (Number/Name) PE 0604602F / <i>Armament/Ordnance Development</i> | | | | Project (Number/Name) 655361 / <i>Stores-Aircraft Interface</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 655361: <i>Stores-Aircraft Interface</i> | - | 5.489 | 4.898 | 8.989 | 0.000 | 8.989 | 5.075 | 5.181 | 5.275 | 5.370 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

The Stores-Aircraft Interface project conducts stores-aircraft interface upgrades and standards development to include the Universal Armament Interface (UAI). UAI is an Air Force initiative to develop standardized software interfaces in aircraft weapons and mission planning. The savings realized from this effort is on average 6 years of schedule and \$22M per aircraft/weapon combination. This is accomplished by enabling integration of weapons independent of aircraft Operational Flight Programs (OFP) cycles. UAI is currently implemented on the F-15E, F-16 Block 40/50 and European Participating Air Forces (EPAF) F-16 aircraft, Small Diameter Bomb (SDB) I and II, Joint Direct Attack Munition (JDAM), Laser JDAM, Joint Air-to-Surface Stand-off Missile (JASSM), and Precision Guided Munitions Planning Software (PGMPS). Planned implementation include Joint Strike Fighter (JSF/F-35), B-21, MQ-9, JASSM-Extended Range (JASSM-ER), F/A-18, Advanced Anti-Radiation Guided Missile - Extended Range (AARGM-ER), Combat Weapons Delivery Software (CWDS), SPEAR3, Joint Strike Missile (JSM), and the Turkish Stand Off Missile - Joint (SOM-J). The UAI program office is responsible for development and enhancement of the standard, support to coalition/allied/joint interoperability efforts for weapons-platform interface, provision of certification tools, and implementation support to aircraft and weapons.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| Title: Universal Armament Interface (UAI) Development | 5.489 | 4.898 | 8.989 | - | 8.989 |
| Description: Conduct stores-aircraft interface upgrades and standards development to the Universal Armament Interface (UAI); development and maintenance to the UAI; and facilitation of aircraft, stores, and mission planning program users in the UAI process. | | | | | |
| FY 2019 Plans: Continue development and configuration management of UAI standards in response to new users and evolving requirements including but not limited to F-35, JASSM-ER, CWDS, F/A-18, B-21, PGMPS, MQ-9, AARGM-ER and Army & Navy UAVs and stores. Support working group management, technical meetings and workshops, risk reduction assessments, common mission planning, and support platform-specific implementation of UAI. Continue maintenance of existing certification tools to meet F-35, SDB II, F/A-18, B-21, AARGM-ER, MQ-9, JSM, SPEAR3, SOM-J and other future user system integration lab test certification needs. These tools are shared among aircraft and weapons programs to reduce time and cost for UAI integration efforts. Support multinational Memorandum of Understanding including but not limited to Joint Strike Missile (JSM), SPEAR 3, and Stand Off Missile - Joint (SOM-J). | | | | | |
| FY 2020 Base Plans: | | | | | |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604602F / <i>Armament/Ordnance Development</i> | Project (Number/Name) 655361 / <i>Stores-Aircraft Interface</i> |

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Continue development and configuration management of UAI in response to evolving requirements including but not limited to F-35, JASSM-ER, SDB II, F/A-18, B-21, AARGM-ER, PGMPs, MQ-9 and Army & Navy UAVs and stores. Support working groups, technical meetings and workshops, risk reduction assessments, common mission planning, and platform-specific implementation of UAI. Maintain existing certification tools to meet current and future user system integration lab test certification needs. These tools are shared among aircraft and weapons programs to reduce time and cost for UAI integration efforts. Support multinational Memorandum of Understanding including but not limited to Joint Strike Missile (JSM), SPEAR 3, and Stand Off Missile - Joint (SOM-J). | | | | | |
| <i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> Increase in funding for FY20 will be used for ongoing efforts to address planned/required interface capabilities. This will enable UAI to be responsive to technology changes, staving off obsolescence, and enable the UAI PO/industry team to support programs (F-35 Blk 4, B-21, MQ-9, AARGM) during critical stages of implementation, minimizing potential schedule slips and increased costs. | | | | | |
| Accomplishments/Planned Programs Subtotals | 5.489 | 4.898 | 8.989 | - | 8.989 |

C. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

N/A

D. Acquisition Strategy

In December 2004, under the authority of a class Justification and Approval (J&A), the UAI program office awarded individual Cost Plus Fixed Fee (CPFF) contracts to Boeing, Lockheed Martin, Northrop Grumman, and Raytheon. Each Original Equipment Manufacturer is responsible for a different piece of the total UAI requirement based on its product-specific (platform/weapon) expertise. During FY10, these contracts expired. Under the authority of the class J&A, Cost Plus Incentive Fee (CPIF) contracts were awarded to the four UAI vendors in August 2010. Follow-on period of performance was awarded in March 2014 for 16 months to better align future contract awards with funding through the Future Years Defense Program. The period of performance was extended to 1 November 2015 to allow immediate start of the effort on F-35/JSF request for changes. A new J&A was approved in January 2015 for the follow-on sole source contracts to the original equipment manufacturers. These new sole-source contracts were awarded in November 2015 and will expire in November 2019. A new J&A was signed in December 2018 and the RFP for a follow-on sole source 5 year contract was released in February 2019.

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604602F / <i>Armament/Ordnance Development</i> | Project (Number/Name) 655361 / <i>Stores-Aircraft Interface</i> |

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604602F / <i>Armament/Ordnance Development</i> | Project (Number/Name) 655361 / <i>Stores-Aircraft Interface</i> |
|--|--|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|---|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Interface Control Document (ICD) Development/Updates/Maintenance | SS/ Various | Boeing Northrop Grumman Lockheed Martin Raytheon : Various | - | 4.525 | Nov 2017 | 4.698 | Nov 2018 | 8.789 | Nov 2019 | - | | 8.789 | Continuing | Continuing | - |
| Certification Tool | SS/CPFF | Boeing Northrop Grumman Lockheed Martin Raytheon : Various | - | 0.764 | Sep 2018 | - | | - | | - | | - | Continuing | Continuing | - |
| Subtotal | | | - | 5.289 | | 4.698 | | 8.789 | | - | | 8.789 | Continuing | Continuing | N/A |

Remarks
New 5 year Follow-on contract will be awarded in November 2019.

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Program Management Administration/Program Support | Various | Various : Various | - | 0.200 | | 0.200 | | 0.200 | | - | | 0.200 | Continuing | Continuing | - |
| Subtotal | | | - | 0.200 | | 0.200 | | 0.200 | | - | | 0.200 | Continuing | Continuing | N/A |

Remarks
PE Systems Contractor provides support to the Program Office for financial services.

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract | |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|-----|
| Project Cost Totals | | - | 5.489 | 4.898 | 8.989 | - | 8.989 | Continuing | Continuing | N/A |

Remarks

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604602F / <i>Armament/Ordnance Development</i> | Project (Number/Name) 655361 / <i>Stores-Aircraft Interface</i> |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|--|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| Stores-Aircraft Interface | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ICD Development/Governance (SJICWG) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Certification Tools (CTs) Dev / Update | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| UAI (Msn Plng) Common Component | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| F-16 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| JDAM, S/W Regression | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| JASSM-ER, Development Rev 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SDB I & II, S/W Regression | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| F-35, Fielding Rev 4 (Program funded) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| B-21, Development (Program funded) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MQ-9, Development | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GW, Development | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SiAW, Development | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| AARGMER, Development | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604602F / <i>Armament/Ordnance Development</i> | Project (Number/Name) 655361 / <i>Stores-Aircraft Interface</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| Stores-Aircraft Interface | | | | |
| ICD Development/Governance (SJICWG) | 1 | 2018 | 4 | 2024 |
| Certification Tools (CTs) Dev / Update | 1 | 2018 | 4 | 2024 |
| UAI (Msn PIng) Common Component | 1 | 2018 | 4 | 2024 |
| F-16 | 1 | 2018 | 4 | 2024 |
| JDAM, S/W Regression | 1 | 2018 | 4 | 2024 |
| JASSM-ER, Development Rev 4 | 1 | 2018 | 4 | 2024 |
| SDB I & II, S/W Regression | 1 | 2018 | 4 | 2024 |
| F-35, Fielding Rev 4 (Program funded) | 1 | 2018 | 4 | 2024 |
| B-21, Development (Program funded) | 1 | 2018 | 4 | 2024 |
| MQ-9, Development | 1 | 2018 | 4 | 2024 |
| GW, Development | 1 | 2018 | 4 | 2024 |
| SiAW, Development | 1 | 2018 | 4 | 2024 |
| AARGMER, Development | 1 | 2018 | 4 | 2024 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0604604F / <i>Submunitions</i> |
|---|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|--|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 2.697 | 2.990 | 3.045 | 0.000 | 3.045 | 3.096 | 3.159 | 3.215 | 3.273 | Continuing | Continuing |
| 653166: <i>Joint Smart Munitions Test and Evaluation</i> | - | 2.697 | 2.990 | 3.045 | 0.000 | 3.045 | 3.096 | 3.159 | 3.215 | 3.273 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

Project Chicken Little (PCL) continues providing superior rapid reaction signature exploitation capabilities for use on both the traditional and the asymmetrical battlefield. PCL delivers vital one-of-a-kind research, development, test, and evaluation (RDT&E) expertise directly to the warfighter, capability developer, and allied/coalition forces.

From its inception in 1985, PCL constantly advances the state-of-the-art for developmental smart munitions, seekers/sensors, and their platforms. PCL also focuses its capability against today's networked weapons, emerging weapon concepts, and helps develop innovative targeting technologies to be employed against a wide variety of vehicle targets, theater air defense units, and an extensive array of associated equipment.

Combat systems and support equipment exhibit physical characteristics (i.e. signatures) and present certain vulnerabilities, which can be exploited by various targeting technologies leading to the elimination or incapacitation of the threat through the application of force (e.g. smart munitions or directed energy) or application of intelligence, surveillance, reconnaissance (ISR) methods. PCL collects physical, functional, and signature attributes of real foreign threat systems and related equipment; these data feed high-fidelity models used to predict detection, classification, vulnerability, and effectiveness performance for ISR sensor and weapon system design. PCL collects high resolution signature data using a variety of ground, air, and space-based sensors against both new and existing (obtained, sustained, and maintained to be signature representative) foreign targets; with and without the presence of camouflage, concealment, and deception materials; and operated using enemy tactics/CONOPS. The resulting highly reliable, realistic data directly support munitions/targeting development programs and helps mitigate overall acquisition risk. PCL serves as a major focal point for joint signature exploitation, collection, and dissemination within the DoD. PCL is a prime contributor in the time critical process to rapidly exploit, assess, and determine US and allied weapon/targeting performance against high value targets. Customers include: the major Defense and Service Intelligence Centers, all Services, the Joint Technical Coordinating Group (JTTCG) who develop the Joint Munitions Effectiveness Manuals (JMEMs), Combatant Commands, AF Major Commands, US Air Force Weapons School curriculum support, and others. Current projects include, but are not limited to: target signature exploitation, target geometric modeling (for identifying vulnerabilities), improving air capabilities against protected structures (specifically hard and deeply buried targets), and the testing of multiple seekers, sensors, and targeting technologies in representative environments against COCOM/MAJCOM/IC high value targets.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver Chicken Little capabilities. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, 0605898F, and 0605833F.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0604604F / <i>Submunitions</i> |
|---|---|

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 2.705 | 2.990 | 3.045 | 0.000 | 3.045 |
| Current President's Budget | 2.697 | 2.990 | 3.045 | 0.000 | 3.045 |
| Total Adjustments | -0.008 | 0.000 | 0.000 | 0.000 | 0.000 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -0.008 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Change Summary Explanation

N/A

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| <p>Title: Project Chicken Little</p> <p>Description: Provide the DoD community accurate multi-spectral signatures obtained from high-value, signature representative modern threat systems using advanced collection technologies.</p> <p>Exploitations typically occur CONUS; however, Project Chicken Little is postured to support OCONUS collections as dictated by mission requirements.</p> <p>A critical underpinning of the System Exploitation major thrust area, Sensor Week, occurs every two years and provides a unique air and ground demonstration/validation of candidate Seeker/Sensor/ISR technologies.</p> | 2.697 | 2.990 | 3.045 | 0.000 | 3.045 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0604604F / <i>Submunitions</i> |
|---|---|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|--|---------|---------|--------------|-------------|---------------|
| <p>Plan and conduct captive carry flight tests and signature collection for seeker/sensor technology evaluations.</p> <p>Develop, validate, and accredit improved models for target vulnerability and weapons effectiveness in support of Combatant Commands' (COCOMs) requirements.</p> <p>FY 2019 Plans: Exploit high value threat systems (typically 4 per year). Provide signature data from multiple threat systems in various environments using advanced and developmental seeker/sensor technologies.</p> <p>Conduct Sensor Week (SW), providing a singularly unique forum for joint service demonstration of developmental and operational seekers/sensors/ISR assets against a wide array of US, coalition, and foreign national ground targets.</p> <p>Exploit the signatures of ISR targets; conduct rapid reaction performance analysis & evaluations in support of COCOM/MAJCOM immediate/urgent warfighter needs; optimize current project methods to support ISR testing; capture and catalog multi-spectral signatures on asymmetric threat Unmanned Aerial Systems (UAS).</p> <p>No OCONUS requirements.</p> <p>Assist in obtaining relevant, high value, and emergent threat assets and/or decoys. Ensure the fleet foreign threat assets remain properly "signature representative" for systems development and testing.</p> <p>Develop, validate, and accredit improved computer models to determine target vulnerability and weapons effectiveness in support of warfighter requirements.</p> <p>FY 2020 Base Plans: Exploit high value threat systems (typically 4 per year). Provide signature data from multiple threat systems in various environments using advanced and developmental seeker/sensor technologies.</p> <p>Conduct Sensor Week (SW), providing a singularly unique forum for joint service demonstration of developmental and operational seekers/sensors/ISR assets against a wide array of US, coalition, and foreign national ground targets.</p> | | | | | |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| | |
|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0604604F / <i>Submunitions</i> |
|---|---|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|---------|---------|--------------|-------------|---------------|
| Exploit the signatures of ISR targets, conduct rapid reaction performance analysis & evaluations in support of COCOM/MAJCOM immediate/urgent warfighter needs, and optimize current project methods to support ISR testing. | | | | | |
| No OCONUS requirements. | | | | | |
| Assist in obtaining relevant, high value, and emergent threat assets and/or decoys. Ensure the fleet foreign threat assets remain properly "signature representative" for systems development and testing. | | | | | |
| Develop, validate, and accredit improved computer models to determine target vulnerability and weapons effectiveness in support of warfighter requirements. | | | | | |
| <i>FY 2020 OCO Plans:</i> N/A | | | | | |
| <i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> Funding increased due to inflation. | | | | | |
| Accomplishments/Planned Programs Subtotals | 2.697 | 2.990 | 3.045 | 0.000 | 3.045 |

D. Other Program Funding Summary (\$ in Millions)
N/A

Remarks

E. Acquisition Strategy
Funds are executed organically in support of test and evaluation activities including studies, analyses, flight & ground tests, model building and simulation. Virtually all of the work is performed in-house by the 96th Test Wing.

F. Performance Metrics
Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|---|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604604F / <i>Submunitions</i> | Project (Number/Name) 653166 / <i>Joint Smart Munitions Test and Evaluation</i> |
|--|---|---|

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---------------------------------|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| 96th Test Wing (96 CTG) | PO | Keeping Fleet Relevant : NV | - | 0.800 | Nov 2017 | 0.800 | Nov 2018 | 0.800 | Nov 2019 | - | | 0.800 | Continuing | Continuing | 0.800 |
| Subtotal | | | - | 0.800 | | 0.800 | | 0.800 | | - | | 0.800 | Continuing | Continuing | N/A |

Remarks
Fleet relevance addresses the acquisition of new and emerging threat vehicles, acquisition of high fidelity decoys, and sustainment of fleet signature quality.

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|---|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| 96th Test Wing (96 CTG and 46 TW) | MIPR | Conducting Tests and Analysis : Eglin AFB, FL | - | 1.842 | Nov 2017 | 2.135 | Nov 2018 | 2.190 | Nov 2019 | - | | 2.190 | Continuing | Continuing | - |
| Subtotal | | | - | 1.842 | | 2.135 | | 2.190 | | - | | 2.190 | Continuing | Continuing | N/A |

Remarks
96th Test Wing (96 CTG, 46 TS) is the Program Office which conducts inhouse testing.

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| 96 Test Wing (96 CTG) | MIPR | 46TS/TGBB : Eglin, FL | - | 0.055 | Nov 2017 | 0.055 | Nov 2018 | 0.055 | Nov 2019 | - | | 0.055 | Continuing | Continuing | - |
| Subtotal | | | - | 0.055 | | 0.055 | | 0.055 | | - | | 0.055 | Continuing | Continuing | N/A |

Remarks
96th Test Wing (96 CTG, 46 TS) is the Program Office which conducts inhouse testing.

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|--|--------------------|----------------|---|---------------------|--------------------|---|----------------------------|-------------------|---------------------------------|--|--|
| Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force | | | | | | | Date: February 2019 | | | | |
| Appropriation/Budget Activity 3600 / 5 | | | R-1 Program Element (Number/Name) PE 0604604F / <i>Submunitions</i> | | | Project (Number/Name) 653166 / <i>Joint Smart Munitions Test and Evaluation</i> | | | | | |
| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract | | |
| Project Cost Totals | - | 2.697 | 2.990 | 3.045 | - | 3.045 | Continuing | Continuing | N/A | | |

Remarks

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604604F / <i>Submunitions</i> | Project (Number/Name) 653166 / <i>Joint Smart Munitions Test and Evaluation</i> |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|--|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| <i>Project Chicken Little; JMT&E</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Target/warhead evaluation/analysis, signature test, captive carry flight tests. | [REDACTED] | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FY18 Sensor Week | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FY20 Sensor Week | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FY22 Sensor Week | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FY24 Sensor Week | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604604F / <i>Submunitions</i> | Project (Number/Name) 653166 / <i>Joint Smart Munitions Test and Evaluation</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|---|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Project Chicken Little; JMT&E</i> | | | | |
| Target/warhead evaluation/analysis, signature test, captive carry flight tests. | 1 | 2018 | 4 | 2024 |
| FY18 Sensor Week | 3 | 2018 | 3 | 2019 |
| FY20 Sensor Week | 3 | 2020 | 3 | 2021 |
| FY22 Sensor Week | 3 | 2022 | 3 | 2023 |
| FY24 Sensor Week | 3 | 2024 | 4 | 2024 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0604617F / <i>Agile Combat Support</i> |
|---|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|--------------------------------------|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 36.351 | 23.489 | 19.944 | 0.000 | 19.944 | 20.646 | 18.033 | 18.359 | 23.219 | Continuing | Continuing |
| 652895: <i>CE Readiness</i> | - | 32.035 | 21.890 | 18.315 | 0.000 | 18.315 | 18.989 | 16.341 | 16.637 | 21.256 | Continuing | Continuing |
| 654910: <i>Aeromedical Readiness</i> | - | 4.316 | 1.599 | 1.629 | 0.000 | 1.629 | 1.657 | 1.692 | 1.722 | 1.963 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

This program provides lighter, leaner, rapidly-deployable and technologically-advanced materiel, forces and capabilities to the warfighter. Current projects in this program include Civil Engineering Readiness (Project 652895) and Aeromedical Readiness (Project 654910). Civil Engineering Readiness projects enable airfield protection, and airfield damage recovery for sustainment, and increased resiliency of airfield operations anywhere in the world. Aeromedical Readiness projects provide aerospace medical systems and treatment equipment to improve casualty care and meet worldwide warfighter medical operational requirements.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver the Civil Engineering and Aeromedical Readiness capabilities. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, 0605898F and 0605833F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 31.240 | 20.028 | 20.344 | 0.000 | 20.344 |
| Current President's Budget | 36.351 | 23.489 | 19.944 | 0.000 | 19.944 |
| Total Adjustments | 5.111 | 3.461 | -0.400 | 0.000 | -0.400 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 6.476 | 3.461 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | -0.005 | 0.000 | | | |
| • SBIR/STTR Transfer | -1.360 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | -0.400 | 0.000 | -0.400 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

Appropriation/Budget Activity
 3600: *Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)*

R-1 Program Element (Number/Name)
 PE 0604617F / *Agile Combat Support*

Congressional Add Details (\$ in Millions, and Includes General Reductions)

Project: 652895: *CE Readiness*

Congressional Add: *Expeditionary Airfield Damage Repair (EADR) JCTD Congressional Add*

Congressional Add: *Explosive Resistant Windows Technology*

Congressional Add Subtotals for Project: 652895

Congressional Add Totals for all Projects

| FY 2018 | FY 2019 |
|---------|---------|
| 2.890 | 0.000 |
| 3.370 | 3.374 |
| 6.260 | 3.374 |
| 6.260 | 3.374 |

Change Summary Explanation

FY18 Congressional add for \$3.5M for Explosive Resistant Window and \$3.0M for PACOM Joint Expeditionary ADR Initiative.

FY19 Congressional Add for \$3.5M for Explosive Resistant Window

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|---|--------------------|----------------|----------------|---------------------|--|----------------------|----------------|----------------|---|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 5 | | | | | R-1 Program Element (Number/Name) PE 0604617F / Agile Combat Support | | | | Project (Number/Name) 652895 / CE Readiness | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 652895: CE Readiness | - | 32.035 | 21.890 | 18.315 | 0.000 | 18.315 | 18.989 | 16.341 | 16.637 | 21.256 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

This Civil Engineering (CE) Readiness project develops Airbase Technologies (ABT), Airfield Damage Repair (ADR), Airfield Protection (AP), Energy & Utilities (E&U), and CE Materials (CEM) solutions for in-garrison, expeditionary, and contingency installations and airbases. This includes: technologies for airfield assessment, pavement repair and unexploded ordnance identification and mitigation to enable rapid recovery and regeneration of airfield operations; infrastructure design criteria, construction methods, hardened shelters, evaluation tools, materials, aviation firefighting, force protection, expeditionary energy, waste water recycling/treatment, CE materials applications and systems for improved resiliency and rapid recovery of airbase and airfield operations following an attack.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| Title: Airbase Technologies | 1.337 | 1.798 | 1.698 |
| Description: Technical support providing RDT&E capabilities for cross-cutting CE applications and processes for all CE functional areas. Provides replacements and repair of critical RDT&E lab equipment, test systems and instruments. Specialized RDT&E systems and software required to conduct CE RDT&E. | | | |
| FY 2019 Plans: Develop and test material technologies for indigenous soil-based cements and bio-cementation for expeditionary ADR, investigate aviation asphalt aging mitigation technologies for reduced life cycle costs, develop and test additive manufacturing approaches for CE applications, develop functionalized materials for hardened infrastructure and force protection applications, investigate and evaluate disposal and mitigation technologies for AFFF, investigate and evaluate expeditionary energy storage systems for incorporation of renewable energy systems with USAF BEAR equipment. Replace/repair critical RDT&E lab equipment. Fund program management support, RDT&E IT systems and software required to conduct CE RDT&E. | | | |
| FY 2020 Plans: Continue development and testing material technologies for indigenous soil-based cements and bio-cementation for expeditionary ADR, test and evaluation of aviation asphalt aging mitigation technologies for reduced life cycle costs, development and testing of additive manufacturing approaches for CE applications, development of functionalized materials for hardened infrastructure and force protection applications, evaluation of disposal and mitigation technologies for AFFF and evaluation of expeditionary energy storage systems for incorporation of renewable energy systems with USAF BEAR equipment. Replace/repair critical RDT&E lab equipment. Fund program management support, RDT&E IT systems and software required to conduct CE RDT&E. | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: | | | |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604617F / Agile Combat Support | Project (Number/Name) 652895 / CE Readiness | | |
| B. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| FY20 decrease due to OCO realignment | | | | |
| Title: Airfield Damage Repair | | 19.774 | 10.564 | 11.066 |
| <p>Description: This effort develops, tests, and certifies equipment, materials, and Tactics, Techniques, and Procedures (TTPs) for the rapid assessment and repair of airfield damage, which includes identification, mitigation or removal of unexploded ordnance and expedient repairs for fuel and utility systems. This effort will also accelerate the transition of proven technologies in expedient and sustained protection of critical infrastructure, including operating surfaces, shelters, fuel storage and distribution systems, and command and control (C2) systems. Further, this effort focuses on the resiliency of airbase infrastructure as well as the timely repair and regeneration of airfield operations within established time limits in order to gain and maintain air superiority.</p> <p>FY 2019 Plans: Continue to mature and transition the rapid assessment, mitigation and repair tools and solutions for airfield damage repair through research, development, testing and evaluation. Rapid assessment includes the development of spiral 2 SUAS, sensors, and automated damaging detection solutions to significantly improve the ability to assess runway damage and conduct the MAOS selection. Mitigation includes the development of generation 2 systems to remotely neutralize and remove UXOs through a family of Rapid Explosive Hazard Mitigation (REHM) systems. Repair of airfield damage focuses on RDT&E of lighter/leaner systems and materials including maximum use of native in-situ materials for airfield recovery.</p> <p>FY 2020 Plans: Mature and transition the rapid assessment, mitigation and repair tools and solutions for airfield damage repair through research, development, testing and evaluation. Rapid assessment includes the development of spiral 3 SUAS, sensors, and automated damaging detection solutions to significantly decrease the assessment time and improve automated detection of unexploded ordnance. Mitigation includes the testing and evaluation of generation 2 systems to remotely neutralize and remove UXOs through a family of Rapid Explosive Hazard Mitigation (REHM) systems. Repair of airfield damage focuses on development, testing and transition of lighter/leaner systems and materials including maximum use of native in-situ materials for airfield recovery.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Increase due to inflation.</p> | | | | |
| Title: Expeditionary Airfield Damage Repair (EADR) JCTD | | 0.000 | 3.374 | 2.751 |
| <p>Description: The purpose of the EADR JCTD is to develop and transition the capability to rapidly and repeatedly repair damaged airfield surfaces operating under the dynamic basing concept of operations (CONOP). The goal is to develop and transition technologies that minimize airfield downtime and maximize combat sortie generation. The JCTD will execute a spiral development-oriented program that will transition mature technologies throughout the life of the program.</p> <p>FY 2019 Plans:</p> | | | | |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604617F / Agile Combat Support | Project (Number/Name) 652895 / CE Readiness |
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| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|---------|---------|---------|
| <p>Define dynamic basing boundary conditions and CONOP necessary to successfully execute a mission with respect to air combat sortie generation. Define, understand, and predict the specific threat environment to dynamic basing operations in terms of necessary rapid repair requirements. Identify necessary minimal aircraft operational requirements for aircraft surface/substrate conditions to support air combat sorties. Execute a series of structured analysis of alternatives (AoA) to identify and down-select capability solutions to meet operational requirements.</p> <p>FY 2020 Plans: Continue to execute and revise a series of structured analysis of alternatives (AoA) to identify and down-select capability solutions to meet operational requirements. Execute a spiral development program to include modeling, JCTD-appropriate advanced technology development, test and evaluation and field-worthy assessment of prototype solutions. Develop and assess the component spiral products comprising the total capability; along with a predictive methodology to estimate site-specific repair requirements and the tactics, techniques and procedures (TTP) necessary for capability operation. Begin transitioning and acquisition of solutions to meet the requirements for expedient and expeditionary airfield damage repair (EADR).</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Program decrease due to a decrease in funding from PACOM in FY20</p> | | | |
| <p>Title: Airfield Protection</p> <p>Description: Research, develop and transition technologies for hardening and protecting airfield infrastructure from munitions attack, unexploded ordnance and aircraft, equipment and infrastructure fires. Included within this effort are structural solutions, expeditionary and expedient hardening and protection solutions, explosive ordnance disposal technologies and aviation firefighting technologies. The technologies developed from this effort provide improved resiliency and rapid restoration of airbase and airfield operations following an attack.</p> <p>FY 2019 Plans: Continue RDT&E of new concepts for protection materials for lighter, less expensive solutions for infrastructure hardening. Advance solution development for penetrating munitions including cruise missile hardening and improve expedient sheltering to address advanced threats. Continue development of selective hardening for infrastructure. Continue development, testing and evaluation of unconventional countermeasures technology. Research and develop aviation firefighting technologies for treatment and replacement of the perfluorinated aqueous film forming foams(AFFF), clean firefighting agents - Halon replacement and aviation firefighting equipment. Research, develop, test and evaluate EOD technologies for neutralization of sub-munition and UXO threats.</p> <p>FY 2020 Plans: Continue RDT&E of new concepts for protection materials for lighter, less expensive solutions for infrastructure hardening. Test and evaluate technologies against penetrating munitions including cruise missile hardening and improve expedient sheltering to address advanced threats. Continue development and begin testing of selective hardening systems for infrastructure. Continue</p> | 4.664 | 2.780 | 2.800 |

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604617F / Agile Combat Support | Project (Number/Name) 652895 / CE Readiness |
|--|--|---|

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|---------|---------|---------|
| testing and evaluation of unconventional countermeasures technology for transition. Continue research and development of aviation firefighting technologies for treatment and replacement of the perfluorinated aqueous film forming foams (AFFF), clean firefighting agents - Halon replacement and aviation firefighting equipment. Continue RDT&E of EOD technologies for neutralization of sub-munition and UXO threats. | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: Increase due to inflation. | | | |
| Accomplishments/Planned Programs Subtotals | 25.775 | 18.516 | 18.315 |

| | FY 2018 | FY 2019 |
|---|---------|---------|
| Congressional Add: Expeditionary Airfield Damage Repair (EADR) JCTD Congressional Add | 2.890 | 0.000 |
| FY 2018 Accomplishments: Commenced Analysis of Alternatives for all spirals. Completed first level down select for technologies to be considered in spirals. Commenced design and construction of test pad for surrogate threat detonations to assess runway damage. Completed first level enhancement of models to predict runway damage in Pacific Area of Responsibility. | | |
| FY 2019 Plans: N/A | | |
| Congressional Add: Explosive Resistant Windows Technology | 3.370 | 3.374 |
| FY 2018 Accomplishments: Awaiting contracting action to execute funds. | | |
| FY 2019 Plans: Develop and assess blast and ballistic resistant window, entry and surrounding structure for improved performance against open blast and cased munitions | | |
| Congressional Adds Subtotals | 6.260 | 3.374 |

| C. Other Program Funding Summary (\$ in Millions) | | | | | | | | | | |
|---|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|------------------------------------|
| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> | <u>FY 2020</u> | <u>FY 2020</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To Complete Total Cost</u> |
| | | | <u>Base</u> | <u>OCO</u> | <u>Total</u> | | | | | |
| • OPAF 04 Line Item 845100A: <i>Contingency Operations - Engineering and EOD Equipment</i> | 93.920 | 105.132 | 31.906 | - | 31.906 | 131.952 | 132.519 | 133.097 | - | Continuing Continuing |

Remarks
FY18-23 Procurement funding for Expedient Small Asset Protection (ESAP) systems, Rapid Airfield Damage Assessment System (RADAS) and Recovery of Airbases Denied by Ordnance (RADBO)in PE 0208028F.

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604617F / <i>Agile Combat Support</i> | Project (Number/Name) 652895 / <i>CE Readiness</i> |
|--|---|--|

D. Acquisition Strategy

This Civil Engineering (CE) Readiness project develops and evaluates technologies for in-garrison, expeditionary, and contingency installations & airbases. This encompasses a wide range of solutions and COTS equipment that are fielded to support the CE mission of the USAF. The acquisition strategy utilizes AFCEC RDT&E contracts as well as other DoD and US Government laboratories/engineering centers and contracts whenever practical for the specific technology development effort.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604617F / Agile Combat Support | Project (Number/Name) 652895 / CE Readiness |
|--|--|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|---|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Airbase Technologies | Various | AFCEC : Tyndall AFB, FL | - | 1.337 | Nov 2017 | 1.798 | Nov 2017 | 1.798 | Nov 2017 | - | | 1.798 | Continuing | Continuing | - |
| Airfield Damage Repair (ADR) | Various | AFCEC : Tyndall AFB, FL | - | 7.270 | Dec 2017 | 2.400 | Dec 2018 | 2.400 | Dec 2019 | - | | 2.400 | Continuing | Continuing | - |
| Airfield Damage Repair (ADR) ERDC | MIPR | USERDC : Vicksburg, MS | - | 3.300 | Dec 2017 | 2.500 | Jan 2019 | 2.400 | Jan 2020 | - | | 2.400 | Continuing | Continuing | - |
| Airfield Damage Repair (ADR) Asphalt | C/CPFF | Applied Research Associates : Tyndall AFB, FL | - | 2.750 | Jan 2018 | 1.500 | Apr 2019 | 1.700 | Apr 2019 | - | | 1.700 | Continuing | Continuing | - |
| Expeditionary Airfield Damage Repair (EADR) JCTD | Various | Not specified. : TBD | - | 2.890 | Aug 2018 | 2.851 | Apr 2019 | 2.751 | Apr 2019 | - | | 2.751 | Continuing | Continuing | - |
| Rapid Explosive Hazard Mitigation (REHM) Robotics | C/CPFF | Applied Research Associates : Tyndall AFB, FL | - | 2.762 | Jan 2018 | 1.250 | Dec 2018 | 1.127 | Sep 2019 | - | | 1.127 | Continuing | Continuing | - |
| Rapid Airfield Damage Assessment System (RADAS) Integration | MIPR | TORC Robotics : Blacksburg, VA | - | 2.100 | Jan 2018 | 2.091 | Dec 2018 | 2.100 | Dec 2018 | - | | 2.100 | Continuing | Continuing | - |
| Airfield Protection | Various | AFCEC : Tyndall AFB, FL | - | 4.967 | Jan 2018 | 1.850 | Sep 2018 | 1.850 | Sep 2018 | - | | 1.850 | Continuing | Continuing | - |
| Airfield Protection (AP) Infrastructure Hardening | C/CPFF | TBD : TBD | - | 3.370 | Sep 2018 | 3.461 | Sep 2018 | 0.000 | Sep 2018 | - | | 0.000 | Continuing | Continuing | - |
| Airfield Protection (AP) Aviation Firefighting Technologies | C/CPFF | Battelle : Panama City, FL | - | - | | 0.900 | Nov 2017 | 0.900 | Nov 2017 | - | | 0.900 | Continuing | Continuing | - |
| BEAR BTEIL | Various | AFCEC : Tyndall AFB, FL | - | - | | - | | - | | - | | - | Continuing | Continuing | - |
| Subtotal | | | - | 30.746 | | 20.601 | | 17.026 | | - | | 17.026 | Continuing | Continuing | N/A |

Remarks
\$77K increase to FY18 ADR due to inflation adjustment

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604617F / Agile Combat Support | Project (Number/Name) 652895 / CE Readiness |
|--|--|---|

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Program Management Administration (PMA) | Various | AFCEC : Tyndall AFB, FL | - | 0.325 | Nov 2017 | 0.325 | Nov 2018 | 0.325 | Apr 2019 | - | | 0.325 | Continuing | Continuing | - |
| Subtotal | | | - | 0.325 | | 0.325 | | 0.325 | | - | | 0.325 | Continuing | Continuing | N/A |

Remarks
PMA includes travel and supplies to support CE Readiness RDT&E activities.

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| A&AS Program Support RDT&E | C/FFP | Multiple : FL | - | 0.964 | Jan 2018 | 0.964 | Jan 2019 | 0.964 | Jan 2020 | - | | 0.964 | Continuing | Continuing | - |
| Subtotal | | | - | 0.964 | | 0.964 | | 0.964 | | - | | 0.964 | Continuing | Continuing | N/A |

Remarks
Advisory and Assistance Services (A&AS) contract support for the Life Cycle Management Center (LCMC) procurement of Expeditionary Small Airfield Protection (ESAP), Expeditionary Large Airfield Protection (ELAP), and WaFERS.

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|
| Project Cost Totals | - | 32.035 | 21.890 | 18.315 | - | 18.315 | Continuing | Continuing | N/A |

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604617F / Agile Combat Support | Project (Number/Name) 652895 / CE Readiness |
|--|--|---|

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| CE Readiness | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Airbase Technologies | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ADR Robotic In-seat Appliques | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ADR In-situ Material Repair RDT&E | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ADR Lighter/Leaner Expeditionary Repair | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| E-ADR JCTD | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| REHM Spiral 2 Rapid UXO Clearance | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RADAS Development, Test & Evaluation | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RADAS Spiral 2 RDT&E | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Airfield Mitigation and Recovery Robotics | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| AFFF disposal and mitigation technologies | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Directed Energy Application for UXO Neutralization | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Civil engineering projects for sustained airbase operations | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Airfield Protection - Advanced Hardening RDT&E | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604617F / <i>Agile Combat Support</i> | Project (Number/Name) 652895 / <i>CE Readiness</i> |
|--|---|--|

Schedule Details

| Events by Sub Project | Start | | End | |
|---|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| CE Readiness | | | | |
| Airbase Technologies | 1 | 2018 | 4 | 2024 |
| ADR Robotic In-seat Appliques | 4 | 2018 | 4 | 2020 |
| ADR In-situ Material Repair RDT&E | 1 | 2018 | 4 | 2023 |
| ADR Lighter/Leaner Expeditionary Repair | 3 | 2018 | 4 | 2022 |
| E-ADR JCTD | 4 | 2018 | 4 | 2022 |
| REHM Spiral 2 Rapid UXO Clearance | 3 | 2018 | 4 | 2023 |
| RADAS Development, Test & Evaluation | 1 | 2018 | 4 | 2023 |
| RADAS Spiral 2 RDT&E | 3 | 2018 | 4 | 2021 |
| Airfield Mitigation and Recovery Robotics | 1 | 2018 | 3 | 2021 |
| AFFF disposal and mitigation technologies | 2 | 2018 | 4 | 2022 |
| Directed Energy Application for UXO Neutralization | 2 | 2019 | 4 | 2023 |
| Civil engineering projects for sustained airbase operations | 2 | 2018 | 1 | 2024 |
| Airfield Protection - Advanced Hardening RDT&E | 1 | 2019 | 4 | 2023 |

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|---|--------------------|----------------|----------------|---------------------|---|----------------------|----------------|----------------|---|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 5 | | | | | R-1 Program Element (Number/Name) PE 0604617F / <i>Agile Combat Support</i> | | | | Project (Number/Name) 654910 / <i>Aeromedical Readiness</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 654910: <i>Aeromedical Readiness</i> | - | 4.316 | 1.599 | 1.629 | 0.000 | 1.629 | 1.657 | 1.692 | 1.722 | 1.963 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

This program provides key capabilities that provide life-saving and/or quality of life technologies and equipment. Aeromedical Readiness program enables the critical care of combat casualties by further developing and optimizing existing technologies for ground Expeditionary Medical Systems (EMEDS) and Aeromedical evacuation systems. EMEDS and Aeromedical Evacuation systems provide the urgent care needed to treat deployed injured warfighters and return them to duty while in country, and to treat combat casualties that need to be safely transported to a stateside hospital for follow on treatment. The program also supports critical capabilities development in the multi-disciplinary areas for light-weight, durable, and rapidly deployable medical equipment to ensure the Air Force is poised to meet future medical readiness and operational requirements. Additionally, the program supports research efforts to optimize human physiologic and cognitive performance.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| <p>Title: Non-Invasive Warming and Cooling Device (NIWCD)</p> <p>Description: Single device to provide therapeutic temperature control during treatment and movement of patient from point of injury through the continuum of care. The mortality in combat casualties with hypothermia is double that of normothermic casualties with similar injuries.</p> <p>FY 2019 Plans: NIWCD design finalization and testing.</p> <p>FY 2020 Plans: NIWCD Completion of contractor testing and FDA approval.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding decreased due to completion of the RDT&E effort.</p> | 1.584 | 0.625 | 0.250 |
| <p>Title: Aeromedical Equipment Testing/Studies/Minor Development</p> <p>Description: Procures and qualifies commercial-off-the shelf (COTS) or near COTS medical and aeromedical products and/or performs minor development/studies efforts and program management activities. Programs/studies that are planned to be undergone in FY20 include, but are not limited to, Multi-channel Infusion Pump for expeditionary purposes (MCIP-E) and Cognitive and Physiologic Performance (CPP) projects, Air Plasma Therapy for hemorrhage control/sterilization, para-rescue equipment modernization, austere environment lab equipment.</p> <p>FY 2019 Plans:</p> | 2.732 | 0.974 | 1.379 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604617F / <i>Agile Combat Support</i> | Project (Number/Name) 654910 / <i>Aeromedical Readiness</i> |
|--|---|---|

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|---------|---------|---------|
| Continue the development of MCIP-E in the Engineering and Manufacturing Development (EMD) phase of the acquisition life cycle. Continue implementation of the acquisition strategy for CPP projects. | | | |
| <i>FY 2020 Plans:</i> Complete testing of the development of MCIP-E in EMD and begin development of high priority warfighter requirements. | | | |
| <i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> Funding increased due to increased effort for the MCIP-E. | | | |
| Accomplishments/Planned Programs Subtotals | 4.316 | 1.599 | 1.629 |

C. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

D. Acquisition Strategy

Programs will consider a streamlined acquisition approach. Whenever practical, commercial items are tested and evaluated as candidates for providing solutions to user needs. This normally involves characterization, verification, and qualification testing to ensure commercial off-the-shelf equipment is properly evaluated to identify any capability gaps that may require minor modifications for military use. However, acquisition strategies may be carried out for traditional Engineering and Manufacturing Development (EMD), e.g., Non-Invasive Warming and Cooling Device (NIWCD). Funds may be used to address associated emerging Aeromedical Readiness requirements and for program management activities.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604617F / Agile Combat Support | Project (Number/Name) 654910 / Aeromedical Readiness |
|--|--|--|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|---------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Non-Invasive Warming and Cooling Device (NIWCD) | C/CPIF | Edaptive Computing : Dayton, OH | - | 1.926 | Apr 2018 | 0.580 | Jan 2019 | - | | - | | - | Continuing | Continuing | - |
| Aeromedical Equipment | C/TBD | TBD : TBD | - | 2.185 | Sep 2018 | 0.774 | May 2019 | 1.367 | Feb 2020 | - | | 1.367 | Continuing | Continuing | - |
| Subtotal | | | - | 4.111 | | 1.354 | | 1.367 | | - | | 1.367 | Continuing | Continuing | N/A |

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Test & Evaluation | MIPR | AFMESA : Ft Detrick, MD | - | 0.120 | May 2018 | 0.150 | Apr 2019 | 0.160 | Mar 2020 | - | | 0.160 | Continuing | Continuing | - |
| Subtotal | | | - | 0.120 | | 0.150 | | 0.160 | | - | | 0.160 | Continuing | Continuing | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|-----------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Program Management Administration | Various | AFLCMC : Wright-Patterson AFB, OH | - | 0.085 | Jul 2018 | 0.095 | Jun 2019 | 0.102 | Jun 2020 | - | | 0.102 | Continuing | Continuing | - |
| Subtotal | | | - | 0.085 | | 0.095 | | 0.102 | | - | | 0.102 | Continuing | Continuing | N/A |

Remarks
FY18 cost increase result of \$12K adjustment for inflation

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract | |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|-----|
| Project Cost Totals | | - | 4.316 | 1.599 | 1.629 | - | 1.629 | Continuing | Continuing | N/A |

Remarks
Aeromedical Equipment is TBD due to contract source selections.

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|---|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604617F / <i>Agile Combat Support</i> | Project (Number/Name) 654910 / <i>Aeromedical Readiness</i> |
|--|---|---|

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
|--|--|
| <i>Aeromedical Readiness RDTE Efforts</i> | |
| EMD Phase for the Non-Invasive Warming & Cooling Device (NIWCD) | |
| Production and Fielding Phase for NIWCD | |
| Conduct market research and initiate EMD for Aeromedical Readiness products including Multi-Channel Infusion Pump - Expeditionary. | |

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|---|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604617F / <i>Agile Combat Support</i> | Project (Number/Name) 654910 / <i>Aeromedical Readiness</i> |
|--|---|---|

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Aeromedical Readiness RDTE Efforts</i> | | | | |
| EMD Phase for the Non-Invasive Warming & Cooling Device (NIWCD) | 1 | 2018 | 1 | 2020 |
| Production and Fielding Phase for NIWCD | 4 | 2019 | 4 | 2022 |
| Conduct market research and initiate EMD for Aeromedical Readiness products including Multi-Channel Infusion Pump - Expeditionary. | 2 | 2018 | 4 | 2024 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force / BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0604706F / <i>Life Support Systems</i> |
|---|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|-------------------------------------|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 10.342 | 8.919 | 8.624 | 0.000 | 8.624 | 18.701 | 18.909 | 19.253 | 19.599 | Continuing | Continuing |
| 65412A: <i>Life Support Systems</i> | - | 10.342 | 8.919 | 8.624 | 0.000 | 8.624 | 18.701 | 18.909 | 19.253 | 19.599 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

This program saves Airmen's lives and improves aircrew performance through better aircrew flight equipment and airman combat systems. Air Force acquisition teams lead the upgrade and fielding of new equipment/systems by assessing deficiencies in existing equipment, identifying and assessing existing products or developing new technology, and conducting required Safe-to-Fly tests, certifications, and studies. Program efforts include, but are not limited to, the following projects: directed energy protective equipment; flight helmets and visors; oxygen breathing systems for aircrew; radios and locator beacons; support equipment; nuclear flash blindness protection; night vision devices; noise reduction devices; anti-gravity (anti-G) suits; flame resistant, retardant and blast/ballistic protective gear; aircraft seating; impact protection equipment; flotation devices; parachutes; ejection seats; physiological monitoring devices and other aircrew/life support/ground crew systems required by the warfighter.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver Life Support capabilities. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, 0605898F, and 0605833F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force / BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0604706F / <i>Life Support Systems</i> |
|---|---|

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 9.060 | 8.919 | 8.624 | 0.000 | 8.624 |
| Current President's Budget | 10.342 | 8.919 | 8.624 | 0.000 | 8.624 |
| Total Adjustments | 1.282 | 0.000 | 0.000 | 0.000 | 0.000 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 1.600 | 0.000 | | | |
| • SBIR/STTR Transfer | -0.318 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Change Summary Explanation

FY 2018 funds include \$1.600 million dollars that was a below threshold reprogramming to support female aircrew flight equipment efforts

C. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| Title: Aircrew Performance Studies/Technology Projects and Minor Development Efforts | 5.433 | 5.306 | 6.999 | - | 6.999 |
| <p>Description: Air Force Life Cycle Management Center's Aircrew Performance Branch is the single USAF focal point for Aircrew Flight Equipment (AFE) Safe-to-Fly (STF) testing certification, addressing Safety Investigation Board (SIB) recommendations, along with studies and analysis. In addition, funding is for efforts that are responses to real-time capability gaps identified by the warfighter which may be satisfied by testing and qualifying commercial-off-the-shelf (COTS) products and/or performing minor development efforts that require less than \$10M per year related to aircrew flight equipment and life support equipment. Previous successful efforts may evolve into enduring capabilities as other users / MAJCOMs seek to incorporate these STF assets into their inventory. The Cold Weather Aviation System (CWAS), Aircrew Body Armor (ABA), BA-X Low Profile Parachute (LPP) and Nuclear Flash Blindness Goggles (NFBG) are currently the active programs within Life Support Systems (LSS). Funds may be used to address associated emerging aircrew/ground crew/egress requirements and for program management activities.</p> <p>FY 2019 Plans: Perform STF testing and certification of COTS products. Address SIB recommendations. Formulate an acquisition strategy for next generation nuclear flash blindness technology. Continue the development/test</p> | | | | | |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force / BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0604706F / <i>Life Support Systems</i> |
|---|---|

C. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|---------|---------|--------------|-------------|---------------|
| efforts of aircrew laser eye protection (ALEP), physiological monitoring devices, next generation fixed wing helmet, female aircrew accommodations, and improvement of parachute/flotation devices. FY 2020 Base Plans: Perform STF testing and certification of COTS products. Address SIB recommendations. Continue the development/test efforts of aircrew laser eye protection (ALEP), radio upgrades, next generation fixed wing helmet, next generation nuclear flash blindness technology, female aircrew accommodations, and improvement of parachute/flotation devices. FY 2019 to FY 2020 Increase/Decrease Statement: Funding increase due to increased activity for the Fixed Wing Helmet Upgrade | | | | | |
| Title: Integrated Aircrew Ensemble (IAE) Description: The Integrated Aircrew Ensemble (IAE) is a multi-layer battle ready system of protective clothing, survival equipment, and anti-G protection equipment worn by aircrew members. The ensemble can layer up to seven (7) components allowing for flexible combinations depending on aircraft type, mission, and threat. Each component design is unique but engineered as a single integrated ensemble to improve mobility by reducing bulk, reducing aircrew fatigue from thermal stress using new breathable materials, and increasing overall system performance. The ensemble components are: 1) outer flight layer, 2) Environmental Protection Layer (EPL) with gloves, 3) Chemical Biological Radiological Layer (CBRL) with glove inserts, 4) Life Preserver Unit (LPU), 5) Counter Chest Pressure Bladder (CCPB), 6) survival vest, and 7) G-suit. FY 2019 Plans: Complete Low Rate Initial Production (LRIP) and Initial Operational Testing and Evaluation. Begin development and test efforts for the G-Suit deficiency corrections. FY 2020 Base Plans: Complete IAE G-Suit deficiency correction. Begin modification efforts for the IAE Rotary/Fixed Wing variant FY 2019 to FY 2020 Increase/Decrease Statement: Funding decreased due to IOT&E completion. | 4.359 | 2.688 | 0.725 | - | 0.725 |
| Title: Advanced Concept Ejection Seat Description: Ejection Seat upgrade for B-2 FY 2019 Plans: | 0.125 | 0.125 | 0.000 | - | 0.000 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force / BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0604706F / <i>Life Support Systems</i> |
|---|---|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|---------|---------|--------------|-------------|---------------|
| Complete reporting from testing agency. FY 2020 Base Plans: N/A FY 2019 to FY 2020 Increase/Decrease Statement: Development and testing completes in FY19. | | | | | |
| Title: Next Generation Ejection Seat Description: The new ejection seat escape system shall safely accommodate greater variation in aircrew minimum/maximum weights, a minimum aircrew sitting height of 31 inches, and the use of Helmet Mounted Displays. It shall reduce the risk of injuries to the arms and legs (especially limb flail), neck, and spinal column throughout the entire ejection event. FY 2019 Plans: Program costs associated with pre-award EMD contract effort to begin qualification testing of selected seat and receive long lead items. FY 2020 Base Plans: Continuing program costs associated with pre-award EMD contract effort to begin qualification testing of selected seat and receive long lead items. FY 2019 to FY 2020 Increase/Decrease Statement: Funding increase due to increase pre-award activities. | 0.425 | 0.800 | 0.900 | - | 0.900 |
| Accomplishments/Planned Programs Subtotals | 10.342 | 8.919 | 8.624 | - | 8.624 |

| D. Other Program Funding Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| • OPAF 04 Line Item 842990: <i>Items Less Than \$5 Million (Safety and Rescue Equipment)</i> | 28.969 | 24.043 | 22.206 | 22.200 | 44.406 | 22.607 | 155.324 | 158.119 | - | Continuing | Continuing |
| Remarks | | | | | | | | | | | |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0604706F / <i>Life Support Systems</i> |
|---|---|

E. Acquisition Strategy
The majority of efforts funded in this project employ a streamlined acquisition approach. Whenever practical, Government-Off-The-Shelf/Commercial-Off-The-Shelf (GOTS/COTS) items are tested and evaluated as candidates for solutions to user needs. This normally involves characterization, verification, and qualification testing to ensure GOTS/COTS equipment is properly certified and adapted for military purposes. However, acquisition strategies may be carried out at the project level for traditional Engineering and Manufacturing Development (EMD), e.g., Integrated Aircrew Ensemble (IAE) and Aircrew Laser Eye Protection (ALEP) Block III. Funds may be used to address associated emerging aircrew/ground crew/egress requirements and for program management activities.

F. Performance Metrics
Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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|--|--|---|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604706F / Life Support Systems | Project (Number/Name) 65412A / Life Support Systems |
|--|--|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Aircrew Performance Studies/Technology Projects/Minor Development Efforts | Various | Multiple Contractors : TBD | - | 4.017 | | 4.193 | | 4.314 | | - | | 4.314 | Continuing | Continuing | - |
| Integrated Aircrew Ensemble (IAE) | C/FPIF | Tiax : Lexington, MA | - | 4.300 | Mar 2018 | 1.950 | Feb 2019 | 0.585 | Jan 2020 | - | | 0.585 | Continuing | Continuing | - |
| Advanced Concept Ejection Seat (ACES) | SS/FFP | United Technologies Aerospace Sys : Colorado Springs, CO | - | 0.125 | May 2018 | - | | - | | - | | - | Continuing | Continuing | - |
| Next Generation Ejection Seat | TBD | TBD : NV | - | 0.000 | Dec 2018 | 0.650 | Apr 2019 | 0.750 | Feb 2020 | - | | 0.750 | Continuing | Continuing | - |
| Subtotal | | | - | 8.442 | | 6.793 | | 5.649 | | - | | 5.649 | Continuing | Continuing | N/A |

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Program Tests (IAE, ACES, CWAS, etc.) | Various | Various : Various, NV | - | 1.125 | Feb 2018 | 1.325 | Feb 2019 | 2.250 | | - | | 2.250 | Continuing | Continuing | - |
| Subtotal | | | - | 1.125 | | 1.325 | | 2.250 | | - | | 2.250 | Continuing | Continuing | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|-----------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Program Management Administration (PMA) | TBD | AFLCMC : Wright-Patterson AFB, OH | - | 0.775 | | 0.801 | | 0.725 | | - | | 0.725 | Continuing | Continuing | - |
| Subtotal | | | - | 0.775 | | 0.801 | | 0.725 | | - | | 0.725 | Continuing | Continuing | N/A |

Remarks
PMA Description: Program Management Support and Travel.

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|--|--------------------|----------------|----------------|---|--------------------|----------------------|-------------------------|--|---------------------------------|--|--|
| Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force | | | | | | | | Date: February 2019 | | | |
| Appropriation/Budget Activity 3600 / 5 | | | | R-1 Program Element (Number/Name) PE 0604706F / <i>Life Support Systems</i> | | | | Project (Number/Name) 65412A / <i>Life Support Systems</i> | | | |
| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract | | |
| Project Cost Totals | - | 10.342 | 8.919 | 8.624 | - | 8.624 | Continuing | Continuing | N/A | | |

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|--|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604706F / <i>Life Support Systems</i> | Project (Number/Name) 65412A / <i>Life Support Systems</i> |
|--|---|--|

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|--|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|--|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| <i>Life Support Systems RDTE Efforts</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IAE [Low Rate Initial Production] Test Assets for IOT&E | █ | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IAE [Initial Operational Test & Evaluation] | | █ | █ | █ | | | | | | | | | | | | | | | | | | | | | | | | |
| IAE [G-Suit Redesign] | | | | | | | █ | █ | | | | | | | | | | | | | | | | | | | | |
| Advance Concept Ejection Seat (ACES) Qualification Testing | █ | █ | █ | █ | | | | | | | | | | | | | | | | | | | | | | | | |
| Next Generation Ejection Seat Pre-Contract Award Activities | | █ | █ | █ | | | | | | | | | | | | | | | | | | | | | | | | |
| Next Generation Ejection Seat Contract Award | | | | | | | | | | | █ | █ | | | | | | | | | | | | | | | | |
| Next Generation Ejection Seat Qualification Effort | | | | | | | | | | | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ |
| Aircrew Performance Aircrew Laser Eye Protection Block 3 Development Award | | | | | | | █ | █ | | | | | | | | | | | | | | | | | | | | |
| Aircrew Performance Next Generation Fixed Wing Helmet Development Award | | | | | | | █ | █ | | | | | | | | | | | | | | | | | | | | |
| Continue projects in support of Aircrew Performance | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ |

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|--|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604706F / <i>Life Support Systems</i> | Project (Number/Name) 65412A / <i>Life Support Systems</i> |
|--|---|--|

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Life Support Systems RDTE Efforts</i> | | | | |
| IAE [Low Rate Initial Production] Test Assets for IOT&E | 1 | 2018 | 2 | 2018 |
| IAE [Initial Operational Test & Evaluation] | 2 | 2018 | 2 | 2019 |
| IAE [G-Suit Redesign] | 3 | 2019 | 4 | 2020 |
| Advance Concept Ejection Seat (ACES) Qualification Testing | 1 | 2018 | 3 | 2019 |
| Next Generation Ejection Seat Pre-Contract Award Activities | 2 | 2018 | 4 | 2019 |
| Next Generation Ejection Seat Contract Award | 1 | 2020 | 1 | 2020 |
| Next Generation Ejection Seat Qualification Effort | 1 | 2020 | 4 | 2024 |
| Aircrew Performance Aircrew Laser Eye Protection Block 3 Development Award | 2 | 2019 | 2 | 2019 |
| Aircrew Performance Next Generation Fixed Wing Helmet Development Award | 3 | 2019 | 3 | 2019 |
| Continue projects in support of Aircrew Performance | 1 | 2018 | 4 | 2024 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0604735F / <i>Combat Training Ranges</i> |
|---|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|--|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 75.981 | 43.895 | 37.365 | 0.000 | 37.365 | 8.915 | 23.995 | 24.428 | 171.510 | Continuing | Continuing |
| 652286: <i>Combat Training Range Equipment</i> | - | 75.981 | 43.895 | 37.365 | 0.000 | 37.365 | 8.915 | 23.995 | 24.428 | 171.510 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

The Combat Training Ranges (CTR) programs provides equipment and support to Air Force units and combat training ranges for electronic warfare (EW) mission testing, training, and evaluation of aircrews, as well as operational testing of weapon systems and tactics under simulated combat conditions. This program provides funding for the development and integration of EW training capabilities to include: Air Combat Training Systems (ACTS); threat emitters; advanced radar threat systems; communication jammers; command and control and debrief capability; and instrumentation equipment/systems. These systems and capabilities support integrated training operations for all aircraft (including 5th Gen) and for joint, coalition, and Live Virtual Constructive (LVC) training events.

The Advanced Radar Threat System (ARTS) programs develop, design, build and test threat system simulators based on advanced foreign fielded surface-to-air missile (SAM) radar threat systems. The ARTS variants will be used at Department of Defense (DoD) training ranges for 4th and 5th generation aircrew training and tactics development to increase combat effectiveness and aircrew survivability by training aircrews to engage or defend against an advanced SAM threat before encountering it in actual combat to stress their tactics, techniques and procedures. The ARTS programs support early research, studies, technology development, and planning for next generation threat systems that challenge the Air Force's asymmetric advantage. The ARTS programs also fund development of high fidelity surrogate targets matching simulated threat systems to stress 5th generation sensor fusion capabilities.

The Legacy Range Threat Systems Low Cost Mod (LRTSLCM) efforts fund development of modifications for legacy threat systems to provide continued combat training relevancy and enhanced systems capabilities. Legacy range threat systems include Multiple Threat Emitter System (MUTES), Miniature Multiple Threat Emitter System (Mini-MUTES), Modular Threat Emitter (MTE) system, Tactical Radar Threat Generator (TRTG) system, Band Simulator, Unmanned Modular Threat Emitter (UMTE) system, and legacy Joint Threat Emitter (JTE) systems. Enhancements focus on upgrading threat systems to match fielded modifications for foreign threat systems faced by combat aircrews. The Common Electronic Attack Receiver (CEAR) provides reactive training and enhanced debriefs using legacy threats. The Digital Threat Relevancy (DTR) effort upgrades Band Simulator and other legacy emitters with modern electronics to improve threat relevance and sustainability. The Double Digit Threat Emitter (DDTE) effort leverages JTE to provide a lower cost EW simulator, enabling greater on-range threat density of advanced SAM radars.

P5 Combat Training System (P5 CTS) program addresses new capability requirements for the fielded P5 system, to include continued operations in a GPS-contested environment. Lastly, this program funds ongoing analyses, studies, risk reduction efforts, and/or technology development to enhance Operational Training Infrastructure (OTI), such as combat training range equipment integration into a blended training (Live, Virtual, Constructive) architecture, communication and GPS jammers, weapon drop scoring systems and infrastructure networks. These enhancements add a critical dimension to exercises and optimize warfighter training.

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0604735F / <i>Combat Training Ranges</i> |
|---|---|

Live Mission Operations Capability (LMOC) will create an efficient, integrated, and high-fidelity range capability in direct support of F-22 and F-35 live-fly qualification and continuation training requirements. LMOC will standardize and connect federated range systems with the goal of providing a seamless training environment to operators and support personnel.

In FY19 Live Mission Operations Capability (LMOC) was a new start.

This program element 0604735F may include necessary civilian pay expenses required to manage, execute, and deliver Combat Training Range weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, 0605898F, and 0605833F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 87.350 | 35.895 | 31.165 | 0.000 | 31.165 |
| Current President's Budget | 75.981 | 43.895 | 37.365 | 0.000 | 37.365 |
| Total Adjustments | -11.369 | 8.000 | 6.200 | 0.000 | 6.200 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | -9.500 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 6.000 | 8.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | -5.199 | 0.000 | | | |
| • SBIR/STTR Transfer | -2.670 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 6.200 | 0.000 | 6.200 |

Congressional Add Details (\$ in Millions, and Includes General Reductions)

Project: 652286: *Combat Training Range Equipment*

Congressional Add: *Test Range Threat Systems*

Congressional Add: *F-35 Advanced Threat Simulator*

| | FY 2018 | FY 2019 |
|--|----------------|----------------|
| | 6.000 | 0.000 |
| | 0.000 | 8.000 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0604735F / <i>Combat Training Ranges</i> |
|---|---|

| Congressional Add Details (\$ in Millions, and Includes General Reductions) | FY 2018 | FY 2019 |
|--|----------------|----------------|
| Congressional Add Subtotals for Project: 652286 | 6.000 | 8.000 |
| Congressional Add Totals for all Projects | 6.000 | 8.000 |

Change Summary Explanation

FY2018 \$6M Congressional Program Increase for "Test Range Threat Systems"; \$9.5M Congressional Reduction for "Forward Financing"; a BTR for Air-launched Rapid Response Weapon (ARRW) for -\$5.199M
 FY2019 Congressional Add of \$8M for F-35 advanced threat simulator
 FY2020 \$6.2M increase to support Live Mission Operations Capability efforts

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| <p>Title: P5 Combat Training System (CTS)</p> <p>Description: P5 CTS funding supports ACTS capabilities and includes the development, integration and testing of future software/hardware upgrades, aircraft/pod integration, upgrades for range applications, and associated studies. Additionally, funding supports efforts to enable initial training interoperability with 5th Generation aircraft via Ground Subsystem (GS) decryption of secure (encrypted) Time, Space Position Information (TSPI), weapon simulation, and other training data.</p> <p>FY 2019 Plans: Funding supports initiation of GPS-contested training operations capability development for the P5 Combat Training System, including program documentation.</p> <p>FY 2020 Plans: Funding will be used to continue GPS-contested training operations capability development for the P5 Combat Training System</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding increased due to the application of an inflation cost factor.</p> | 0.499 | 0.175 | 0.200 |
| <p>Title: Legacy Range Threat Systems</p> <p>Description: The Legacy Range Threat Systems Low Cost Mod (LRTSLCM) efforts fund development of modifications for legacy threat systems to provide continued combat training relevancy and enhanced systems capabilities. Legacy range threat systems include Multiple Threat Emitter System (MUTES), Miniature Multiple Threat Emitter System (Mini-MUTES), Modular Threat Emitter (MTE) system, Tactical Radar Threat Generator (TRTG) system, Band Simulator (Band Sim), Unmanned Modular Threat Emitter (UMTE) system, legacy Joint Threat Emitter (JTE) systems, and other radar systems fielded throughout the combat training range enterprise. Enhancements focus on upgrading threat systems to match fielded modifications for foreign threat systems faced by combat aircrews. The Common Electronic Attack Receiver (CEAR) provides reactive training and enhanced debriefs using legacy</p> | | | |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | | R-1 Program Element (Number/Name) PE 0604735F / <i>Combat Training Ranges</i> | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| <p>threats. The Digital Threat Relevancy (DTR) effort upgrades Band Simulator and other legacy emitters with modern electronics to improve threat relevance and sustainability. The Double Digit Threat Emitter (DDTE) effort leverages JTE to provide a lower cost EW simulator, enabling greater on-range threat density of advanced SAM radars.</p> <p>FY 2019 Plans: FY2018 and FY2019 funding for Legacy Threat Systems efforts captured under Digital Threat Relevancy (DTR). Beginning in FY20, all Legacy Threat System efforts, to include DTR funds will be captured in this major thrust area.</p> <p>FY 2020 Plans: Funding will support preparation for Mini-MUTES modification for improved threat relevance and required relevancy upgrades to support JPARC legacy systems.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding increased due to emerging Legacy System Modification requirements.</p> | | | | |
| <p>Title: Advanced Radar Threat System (ARTS-V1)</p> <p>Description: ARTS-V1 program will develop, design, build and test threat system simulators based on advanced strategic, long-range, re-locatable foreign fielded SAM radar threat systems. ARTS-V1 will leverage an existing DoD test resource development program to reduce non-recurring development cost, minimize schedule risk, and promote range interoperability between test and training. Various aircraft platforms may train against ARTS-V1, but the most stringent requirements for ARTS-V1 come from 5th generation aircraft capabilities. Additionally, development of a high-fidelity surrogate target, ongoing analyses, studies, and risk reduction efforts will focus on integrating ARTS and other systems into regional range and LVC architectures.</p> <p>FY 2019 Plans: ARTS-V1 funding is being used to support the development of a Production Representative Article (PRA) and preparation for integration and testing. It also supports efforts to build a technical data package. Additionally funding is supporting ongoing analyses and studies focused on integrating ARTS into regional range and LVC architectures.</p> <p>FY 2020 Plans: ARTS-V1 funding will support the development of a PRA and prepare for integration and testing, along with finalization of the technical data package. Additionally, funding is supporting ongoing analyses and studies focused on integrating ARTS into regional range and LVC architectures.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding increased due to additional test and continuing PRA development work.</p> | | 24.157 | 3.788 | 13.100 |
| <p>Title: Advanced Radar Threat System (ARTS-V2)</p> | | 32.989 | 31.182 | 10.200 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | | R-1 Program Element (Number/Name) PE 0604735F / <i>Combat Training Ranges</i> | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| <p>Description: The ARTS-V2 program will develop, design, build and test a threat system simulator based on an advanced tactical, mobile, short/medium range foreign fielded SAM radar threat system. Various aircraft platforms may train against ARTS-V2, but the most stringent requirements placed on ARTS-V2 design come from 5th generation aircraft capabilities. Additionally, ongoing analyses, studies, and risk reduction efforts will focus on integrating ARTS-V2 and other systems into LVC architectures.</p> <p>FY 2019 Plans: Funds are being used for development (technical design reviews, integration, fabrication and testing) of a PRA under the Engineering and Manufacturing Development (EMD) contract. Additionally, funding is supporting ongoing analyses and studies focused on integrating ARTS into regional range and LVC architectures.</p> <p>FY 2020 Plans: ARTS-V2 funding will support completion of the development (technical design reviews, integration, fabrication and testing) of a PRA under the EMD contract. Additionally, funding will support ongoing analyses and studies focused on integrating ARTS into regional range and LVC architectures.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding decreased due to the program progressing through EMD and shifting from design and article build to test.</p> | | | | |
| <p>Title: Advanced Radar Threat System (ARTS-V3) Development</p> <p>Description: The ARTS-V3 program will develop, design, build and test an advanced surface-to-air threat simulation systems replicating strategic/tactical threat(s) at the fidelity necessary to stress current EW systems, 5th generation and beyond air platform engagements and be integrated into a future Combat Air Forces (CAF) LVC system. ARTS-V3 will provide an A2/AD environment for CAF test and training with a highly reactive threat systems that provides immediate feedback to aircrews. The ARTS-V3 system will create a relevant combat training threat system that is dynamic and reconfigurable to represent a modern and dynamic adversary force.</p> <p>FY 2019 Plans: ARTS-V3 funds are being used to continue to establish the program foundation to include intelligence and requirements support, early research, studies, support technology maturation, and planning to support a Milestone decision. Funds are supporting intelligence data to ensure emulation of the real world system is relevant and realistic.</p> <p>FY 2020 Plans:</p> | | 9.700 | 0.000 | 5.183 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | | R-1 Program Element (Number/Name) PE 0604735F / <i>Combat Training Ranges</i> | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| ARTS-V3 funding will continue intelligence and requirements support, early research, studies, risk reduction, and support technology maturation and reduce program risk. Funds are supporting intelligence data to ensure emulation of the real world system is relevant and realistic. FY 2019 to FY 2020 Increase/Decrease Statement: Funding increased due to a ramp in threat intelligence studies and risk reduction efforts in preparation for system development. | | | | |
| Title: Advanced Radar Threat System (ARTS-V4) Description: The ARTS-V4 program will develop, design, build and test a modern surface-to-air threat simulation system(s) replicating tactical highly mobile threats at the fidelity necessary to stress current EW systems, 5th generation and beyond air platform engagements and be integrated into a future CAF LVC system. ARTS-V4 will leverage existing DoD training resource development programs to reduce non-recurring development cost, schedule risk, and promote range interoperability between test and training. The ARTS-V4 system will create a relevant combat training threat system that is dynamic and reconfigurable to represent a dynamic adversary force. Additionally funding will support ongoing analyses and studies focused on integrating ARTS into regional range and LVC architectures. FY 2019 Plans: ARTS-V4 funds are being used to continue to establish the program foundation to include intelligence and requirements support, early research, studies, support technology maturation, and planning to support a Milestone B decision. Funding will be used to support intelligence data to ensure emulation of the real world system is relevant and realistic. FY 2020 Plans: ARTS-V4 funding will support finalizing program foundation to include intelligence and requirements support, early research, studies, support technology maturation and demonstration, and planning to support a Milestone B decision. Funding will be used to support intelligence data to ensure emulation of the real world system is relevant and realistic. FY 2019 to FY 2020 Increase/Decrease Statement: Funding increased due to program support costs ramping towards system development. | | 2.500 | 0.000 | 1.540 |
| Title: Digital Threat Relevancy (DTR) Description: DTR will conduct RDT&E to modernize the Range Threat family of systems, focusing on the Band Sim System and MTE System. Foreign fielded SAM threat systems have undergone major modernization programs to replace aging analog technology with modern digital electronics. This program requires the development of digital electronics upgrades to provide realistic electronic warfare training to combat aircrews. This effort will improve threat fidelity (ensuring threat-representative Radio Frequency (RF) emissions), increase reliability, maintainability, supportability, system mobility, and support remote operations | | 0.136 | 0.400 | 0.000 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | | R-1 Program Element (Number/Name) PE 0604735F / <i>Combat Training Ranges</i> | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| with Digital Integrated Air Defense Systems (DIADS). This effort supports warfighter development of new tactics, techniques, and procedures in a relevant, realistic combat environment. | | | | |
| FY 2019 Plans: DTR funding will support solicitation and source selection through contract award to design and build a prototype of an MTE 450V Power Supply as a first step in upgrading aging threat systems to replicate modernized foreign threat systems. Efforts are focusing on replacing analog technology with digital electronics. | | | | |
| FY 2020 Plans: N/A | | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: Funding decreased due to efforts under this thrust area transitioning to the Legacy Range Threat Systems thrust area. | | | | |
| Title: Live Mission Operations Capability (LMOC) | | 0.000 | 0.350 | 6.992 |
| Description: LMOC will regionalize and standardize training airspace, threat systems, and control centers to better challenge 5th generation aircrew and provide comprehensive training support for all warfighters. It will provide a node-based enterprise that integrates range system capabilities in a multi-level secure environment to enable blended live-synthetic training for combat and combat support units including F-22 and F-35. It will address three combat training capability requirements: build and display an integrated surface and air picture; manage training; and enable Live Virtual Constructive training operations. | | | | |
| FY 2019 Plans: Funds are supporting risk reduction, pre-solicitation for development and fielding efforts, Milestone B preparation, initial stand-up of a hardware-in-the-loop lab, and associated acquisition efforts to include logistics, testing, and cyber security planning. Additionally, funds are supporting the continuation of requirements documentation development and early system studies and the start of a system integration laboratory. | | | | |
| FY 2020 Plans: Funding will support initial stand-up of a system integration laboratory and further risk reduction activities and requirement documentation development. | | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: Funding increased due to ramping up of early risk reduction and planning efforts in preparation for Milestone Decision. | | | | |
| Accomplishments/Planned Programs Subtotals | | 69.981 | 35.895 | 37.365 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0604735F / <i>Combat Training Ranges</i> | |

| | FY 2018 | FY 2019 |
|--|---------|---------|
| Congressional Add: Test Range Threat Systems <i>FY 2018 Accomplishments:</i> Funds support development of an ARTS-V2 PRA under the EMD contract. <i>FY 2019 Plans:</i> N/A | 6.000 | 0.000 |
| Congressional Add: F-35 Advanced Threat Simulator <i>FY 2018 Accomplishments:</i> N/A <i>FY 2019 Plans:</i> Funding is being used to study enhancements to legacy systems capable of providing advanced SAM threats through integration of commercial off-the-shelf or previously developed technology into existing systems at Joint Pacific Alaska Range Complex. | 0.000 | 8.000 |
| Congressional Adds Subtotals | 6.000 | 8.000 |

D. Other Program Funding Summary (\$ in Millions)

| Line Item | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|--|---------|---------|-----------------|----------------|------------------|---------|---------|---------|---------|---------------------|------------|
| • OPAF 03 Line Item 834190: <i>Combat Training Ranges</i> | 89.776 | 235.198 | 233.993 | - | 233.993 | 193.955 | 222.772 | 175.130 | 178.283 | Continuing | Continuing |
| • OPAF 05 Line Item 861900: <i>Spares and Repair Parts</i> | 8.188 | 6.435 | 2.322 | - | 2.322 | 8.252 | 19.100 | 11.428 | 0.738 | Continuing | Continuing |
| • APAF 07 Line Item 000075: <i>Other Production Charges</i> | 0.000 | 8.332 | 0.300 | - | 0.300 | 3.500 | 0.300 | 0.300 | 0.300 | Continuing | Continuing |

Remarks

E. Acquisition Strategy

The acquisition strategy varies by effort. Overall strategy is competition focused, with both cost plus and fixed price contracts.

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|---|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604735F / <i>Combat Training Ranges</i> | Project (Number/Name) 652286 / <i>Combat Training Range Equipment</i> |
|--|---|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|-------------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Advanced Radar Threat System-Variant 3 (ARTS-V3) Development | MIPR | Various : Huntsville, AL | - | 5.700 | Dec 2017 | - | | - | | - | | - | Continuing | Continuing | - |
| Advanced Radar Threat System-Variant 1 (ARTS-V1) Development | Various | Various : Pax River, MD | - | 20.700 | Mar 2018 | 3.788 | Jun 2019 | 9.000 | Dec 2019 | - | | 9.000 | Continuing | Continuing | - |
| Advanced Radar Threat System-Variant 2 (ARTS-V2) Development | C/FPIF | Lockheed Martin : Grand Prairie, TX | - | 36.500 | Jun 2018 | 28.000 | Jan 2019 | 8.600 | Nov 2019 | - | | 8.600 | Continuing | Continuing | - |
| Advanced Radar Threat System-Variant 4 (ARTS-V4) Development | Various | Various : Hill AFB, UT | - | 2.500 | May 2018 | - | | 0.840 | Nov 2019 | - | | 0.840 | Continuing | Continuing | - |
| Live Mission Operation Capability (LMOC) | Various | Various : Hill AFB, UT | - | - | | 0.350 | Mar 2019 | 6.192 | Jun 2020 | - | | 6.192 | Continuing | Continuing | - |
| Subtotal | | | - | 65.400 | | 32.138 | | 24.632 | | - | | 24.632 | Continuing | Continuing | N/A |

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Advanced Radar Threat Systems (Direct Msn Spt) | Various | Various : Various, NV | - | 4.000 | Feb 2019 | - | | 5.183 | Dec 2019 | - | | 5.183 | Continuing | Continuing | - |
| Subtotal | | | - | 4.000 | | - | | 5.183 | | - | | 5.183 | Continuing | Continuing | N/A |

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Advanced Radar Threat Systems (Direct Msn Spt) | C/Various | Not specified. : TBD | - | - | | - | | 2.600 | Jun 2020 | - | | 2.600 | Continuing | Continuing | - |
| Subtotal | | | - | - | | - | | 2.600 | | - | | 2.600 | Continuing | Continuing | N/A |

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604735F / Combat Training Ranges | Project (Number/Name) 652286 / Combat Training Range Equipment |
|--|--|--|

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Advanced Radar Threat Systems (PMA/A&AS) | Various | Various : Hill AFB, UT | - | 5.946 | Jun 2018 | 3.182 | Jun 2019 | 3.800 | May 2020 | - | | 3.800 | Continuing | Continuing | - |
| P5 CTS (PMA/A&AS) | Various | AFLCMC/AZS : Hill AFB, UT | - | 0.499 | Mar 2018 | 0.175 | Jun 2019 | 0.200 | Feb 2020 | - | | 0.200 | Continuing | Continuing | - |
| Live Mission Operations Capability (LMOC) (PMA/A&AS) | Various | AFLCMC/AZS : Hill AFB, UT | - | - | | - | | 0.800 | Feb 2020 | - | | 0.800 | Continuing | Continuing | - |
| Digital Threat Relevancy (PMA/A&AS) | Various | AFLCMC/AZS : Hill AFB, UT | - | 0.136 | Jan 2019 | 8.400 | Jun 2019 | - | | - | | - | Continuing | Continuing | - |
| Legacy Range Threat Systems Low Cost Mod (LRTSLCM) (PMA/A&AS) | Various | AFLCMC/AZS : Hill AFB | - | - | | - | | 0.150 | Apr 2020 | - | | 0.150 | Continuing | Continuing | - |
| Subtotal | | | - | 6.581 | | 11.757 | | 4.950 | | - | | 4.950 | Continuing | Continuing | N/A |
| Project Cost Totals | | | - | 75.981 | | 43.895 | | 37.365 | | - | | 37.365 | Continuing | Continuing | N/A |

Remarks

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604735F / <i>Combat Training Ranges</i> | Project (Number/Name) 652286 / <i>Combat Training Range Equipment</i> |

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Combat Training Range Equipment | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| P5CTS Development | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| -- P5 CTS GPS-Contested Training Operation Capability | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Advanced Radar Threat System-Variant 1(ARTS-V1) EMD Phase | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| -- Develop First Article (PRA) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| -- Factory Acceptance Test | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| --DT-E AND OT-E | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| -- Milestone C | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Advanced Radar Threat System-Variant 2 (ARTS-V2) EMD Phase | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| -- ARTS-V2 Contract | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| -- ARTS-V2 PDR | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| -- ARTS-V2 CDR | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| -- ARTS-V2 DT-E and OT-E | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| -- ARTS-V2 Milestone C | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Advanced Radar Threat System-Variant 3 (ARTS-V3) System Spec Definition | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| --ARTS-V3 First Intel Assessment | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| -- ARTS V-3 Second Intel Assessment | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| -- ARTS V-3 Risk Reduction | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| -- ARTS V-3 PRA Development Decision | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Advanced Radar Threat System-Variant 4 (ARTS-V4) Pre-milestone B | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| -- ARTS-V4 Milestone B | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force **Date:** February 2019

| | | |
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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604735F / <i>Combat Training Ranges</i> | Project (Number/Name) 652286 / <i>Combat Training Range Equipment</i> |
|--|---|---|

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|--|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| -- ARTS-V4 Development | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| -- ARTS-V4 Milestone C | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Digital Threat Relevancy (DTR), Emitter Development | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Live Mission Operations Capability (LMOC) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604735F / <i>Combat Training Ranges</i> | Project (Number/Name) 652286 / <i>Combat Training Range Equipment</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|---|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| Combat Training Range Equipment | | | | |
| P5CTS Development | 3 | 2019 | 4 | 2022 |
| -- P5 CTS GPS-Contested Training Operation Capability | 3 | 2019 | 4 | 2022 |
| Advanced Radar Threat System-Variant 1(ARTS-V1) EMD Phase | 1 | 2018 | 4 | 2022 |
| -- Develop First Article (PRA) | 1 | 2018 | 2 | 2021 |
| -- Factory Acceptance Test | 2 | 2021 | 2 | 2021 |
| --DT-E AND OT-E | 3 | 2021 | 2 | 2022 |
| -- Milestone C | 2 | 2023 | 2 | 2023 |
| Advanced Radar Threat System-Variant 2 (ARTS-V2) EMD Phase | 1 | 2018 | 4 | 2022 |
| -- ARTS-V2 Contract | 1 | 2018 | 4 | 2021 |
| -- ARTS-V2 PDR | 3 | 2018 | 3 | 2018 |
| -- ARTS-V2 CDR | 1 | 2019 | 1 | 2019 |
| -- ARTS-V2 DT-E and OT-E | 3 | 2020 | 3 | 2021 |
| -- ARTS-V2 Milestone C | 4 | 2021 | 4 | 2021 |
| Advanced Radar Threat System-Variant 3 (ARTS-V3) System Spec Definition | 1 | 2018 | 2 | 2022 |
| --ARTS-V3 First Intel Assessment | 1 | 2018 | 4 | 2019 |
| -- ARTS V-3 Second Intel Assessment | 3 | 2020 | 2 | 2022 |
| -- ARTS V-3 Risk Reduction | 3 | 2019 | 2 | 2021 |
| -- ARTS V-3 PRA Development Decision | 2 | 2021 | 2 | 2021 |
| Advanced Radar Threat System-Variant 4 (ARTS-V4) Pre-milestone B | 1 | 2018 | 3 | 2020 |
| -- ARTS-V4 Milestone B | 2 | 2021 | 2 | 2021 |
| -- ARTS-V4 Development | 3 | 2021 | 4 | 2024 |

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|---|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604735F / <i>Combat Training Ranges</i> | Project (Number/Name) 652286 / <i>Combat Training Range Equipment</i> |
|--|---|---|

| Events by Sub Project | Start | | End | |
|---|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| -- ARTS-V4 Milestone C | 4 | 2024 | 4 | 2024 |
| Digital Threat Relevancy (DTR), Emitter Development | 3 | 2019 | 2 | 2020 |
| Live Mission Operations Capability (LMOC) | 2 | 2019 | 4 | 2023 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|--|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force / BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0604800F / F-35 - EMD |
|---|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|--|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | 50,438.576 | 282.126 | 69.001 | 7.628 | 0.000 | 7.628 | 5.434 | 0.013 | 0.000 | 0.000 | 0.000 | 50,802.778 |
| 653831: <i>Joint Strike Fighter</i> | 50,438.576 | 263.936 | 69.001 | 7.628 | 0.000 | 7.628 | 5.434 | 0.013 | 0.000 | 0.000 | 0.000 | 50,784.588 |
| 653832: <i>JSF DEPLOYABILITY AND SUITABILITY ENHANCEMENT</i> | 0.000 | 18.190 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 18.190 |

Program MDAP/MAIS Code: 198

A. Mission Description and Budget Item Justification

The F-35 Joint Strike Fighter (JSF) Program will develop and field an affordable, highly common family of next generation strike aircraft for the USN, USAF, USMC and allies. The three variants are the F-35A conventional takeoff and landing; F-35B short takeoff and vertical landing; and the F-35C Aircraft Carrier suitable variant. The F-35A will be a stealthy multi-role aircraft, primary air-to-ground for the Air Force to replace the F-16 and A-10 and complement the F-22. The F-35B variant will be a multi-role strike fighter aircraft to replace the AV-8B and F/A-18 for the Marine Corps, replace the Sea Harrier and GR 7 for the United Kingdom, and replace the AV-8 currently employed by the Italian Navy. The F-35C will provide the Department of the Navy a multi-role, stealthy strike fighter aircraft to complement the F/A-18E/F.

The United Kingdom, Italy, Netherlands, Turkey, Canada, Australia, Denmark, Norway, and Foreign Military Sales customers are also participants in the JSF program. The program shown here reflects USN, USMC, USAF, and International Partner funding.

Funding at the accomplishment/planned program level is reported as the total of all services and partners as these activities support all aircraft variants.

The System Development and Demonstration (SDD) budget funds a total quantity of 20 RDT&E test articles to include 6 ground test articles and 14 flight test articles for USN, USAF, and USMC use.

- FY07: 1 F-35A flight test article
- FY08: 1 F-35B flight test article; 1 F-35B ground test article
- FY09: 1 F-35B flight test article; 2 F-35A ground test articles
- FY10: 6 flight test articles: 3 F-35A, 2 F-35B, 1 F-35C; 3 ground test articles: 1 F-35B, 2 F-35C
- FY11: 4 flight test articles: 1 F-35A, 1 F-35B, 2 F-35C
- FY13: 1 F-35C flight test article

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0604800F / F-35 - EMD |
|---|--|

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 292.947 | 69.001 | 7.743 | 0.000 | 7.743 |
| Current President's Budget | 282.126 | 69.001 | 7.628 | 0.000 | 7.628 |
| Total Adjustments | 0.000 | 0.000 | -0.115 | 0.000 | -0.115 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | -0.115 | 0.000 | -0.115 |

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|---|--------------------|----------------|----------------|---------------------|--|----------------------|----------------|----------------|---|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 5 | | | | | R-1 Program Element (Number/Name) PE 0604800F / F-35 - EMD | | | | Project (Number/Name) 653831 / Joint Strike Fighter | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 653831: <i>Joint Strike Fighter</i> | 50,438.576 | 263.936 | 69.001 | 7.628 | 0.000 | 7.628 | 5.434 | 0.013 | 0.000 | 0.000 | 0.000 | 50,784.588 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

Note

Total cost including United States Navy (USN), United States Marine Corps (USMC), International partner contributions and United States Air Force (USAF) funding are: FY18 \$537.671M and FY19 \$196.104M and FY20 \$10.828 R-2 data reflects variant unique funding only.

R-2A(section B)/R-3 displays total combined Program (i.e. not Service specific), including International partners.

F-35 EMD Includes:

- USAF PE 0604800F BPAC 653831
- USN PE 0604800N Project Unit 2261
- USMC PE 0604800M Project Unit 2262

D&S Includes:

- USAF PE 0604800F BPAC 653832
- USN PE 0604800N Project Unit 3352
- USMC PE 0604800M Project Unit 3350

A. Mission Description and Budget Item Justification

The F-35 Joint Strike Fighter (JSF) Program will develop and field an affordable, highly common family of next generation strike aircraft for the USN, USAF, USMC and allies. The three variants are the F-35A conventional takeoff and landing; F-35B short takeoff and vertical landing; and the F-35C Aircraft Carrier suitable variant. The F-35A will be a stealthy multi-role aircraft, primary air-to-ground for the Air Force to replace the F-16 and A-10 and complement the F-22. The F-35B variant will be a multi-role strike fighter aircraft to replace the AV-8B and F/A-18 for the Marine Corps, replace the Sea Harrier and GR 7 for the United Kingdom, and replace the AV-8 currently employed by the Italian Navy. The F-35C will provide the Department of the Navy a multi-role, stealthy strike fighter aircraft to complement the F/A-18E/F.

The United Kingdom, Italy, Netherlands, Turkey, Canada, Australia, Denmark, Norway, and Foreign Military Sales customers are also participants in the JSF program. The program shown here reflects USN, USMC, USAF, and International Partner funding.

Funding at the accomplishment/planned program level is reported as the total of all services and partners as these activities support all aircraft variants.

The System Development and Demonstration (SDD) budget funds a total quantity of 20 RDT&E test articles to include 6 ground test articles and 14 flight test articles for USN, USAF, and USMC use.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|---|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604800F / F-35 - EMD | Project (Number/Name) 653831 / Joint Strike Fighter |
|--|--|---|

FY07: 1 F-35A flight test article
 FY08: 1 F-35B flight test article; 1 F-35B ground test article
 FY09: 1 F-35B flight test article; 2 F-35A ground test articles
 FY10: 6 flight test articles: 3 F-35A, 2 F-35B, 1 F-35C; 3 ground test articles: 1 F-35B, 2 F-35C
 FY11: 4 flight test articles: 1 F-35A, 1 F-35B, 2 F-35C
 FY13: 1 F-35C flight test article

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|--|---------|---------|--------------|-------------|---------------|
| <p>Title: System Development and Demonstration (SDD) (F-35 JSF)</p> <p>Description: SDD execution of the Air System with Lockheed Martin, including International Commonality Effort which includes airframe, vehicle systems, mission systems, autonomic logistics, systems engineering, and integrated test efforts.</p> <p>FY 2019 Plans: Continue SDD execution of the Air System with Lockheed Martin, including International Commonality Effort which includes, airframe, vehicle systems, mission systems, autonomic logistics, systems engineering, and integrated test efforts. Activity aligned to IMS in accordance with variant IOC.</p> <p>FY 2020 Base Plans: Continue SDD execution of the Air System with Lockheed Martin, including International Commonality Effort which includes, airframe, vehicle systems, mission systems, autonomic logistics, systems engineering, and integrated test efforts. Activity aligned to IMS in accordance with variant IOC. Conduct SDD closure activities including FCA/PCA in order to establish production specification and transition to post-SDD, production and sustainment.</p> <p>FY 2020 OCO Plans: N/A</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY20 funding decrease is due to reduction in domestic and International controls as SDD phase draws to closure.</p> | 377.434 | 105.710 | 10.828 | 0.000 | 10.828 |
| <p>Title: F135 Propulsion System (F-35 JSF)</p> <p>Description: SDD execution of the F135 Propulsion System with Pratt & Whitney that includes engine testing, autonomic logistics, integration and performing technology maturation efforts.</p> <p>FY 2019 Plans:</p> | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|---|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604800F / F-35 - EMD | Project (Number/Name) 653831 / Joint Strike Fighter |
|--|--|---|

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|---------|---------|--------------|-------------|---------------|
|---|---------|---------|--------------|-------------|---------------|

| | | | | | |
|---|--|--|--|--|--|
| N/A FY 2020 Base Plans: N/A FY 2020 OCO Plans: N/A FY 2019 to FY 2020 Increase/Decrease Statement: N/A | | | | | |
|---|--|--|--|--|--|

| | | | | | |
|--|-------|-------|-------|-------|-------|
| Title: Systems Engineering (SE) (F-35 JSF) Description: SDD SE including systems operations requirements analysis, program integration, requirements integration, and interoperability support. FY 2019 Plans: N/A FY 2020 Base Plans: N/A FY 2020 OCO Plans: N/A FY 2019 to FY 2020 Increase/Decrease Statement: N/A | 0.911 | 0.000 | 0.000 | 0.000 | 0.000 |
|--|-------|-------|-------|-------|-------|

| | | | | | |
|---|--------|--------|-------|-------|-------|
| Title: Development Test and Evaluation (DT&E) (F-35 JSF) Description: Government DT&E/Operational Testing (OT) in support of first flight of test aircraft. Elements of DT&E includes preparation for flight testing and weapons integration testing. FY 2019 Plans: Continue government DT&E/IOT&E in support of test aircraft. Continue flight sciences testing of CTOL, STOVL, and CV variants to expand air vehicle envelope and support mission systems testing. Elements of DT&E include flight testing, weapons integration testing, and component capabilities testing. FY 2020 Base Plans: | 98.035 | 76.935 | 0.000 | 0.000 | 0.000 |
|---|--------|--------|-------|-------|-------|

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|---|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604800F / F-35 - EMD | Project (Number/Name) 653831 / Joint Strike Fighter |
|--|--|---|

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|--|----------------|----------------|-------------------------|------------------------|--------------------------|
| IOT&E conclusion and reporting requirements. FY 2020 OCO Plans: N/A FY 2019 to FY 2020 Increase/Decrease Statement: FY20 funding decrease is due to reduction in domestic and International controls as SDD phase draws to closure. | | | | | |
| Title: Development Support (F-35 JSF) Description: SDD Support efforts for airframe, air vehicle systems, mission systems, weapons integration, mission support, and autonomic logistics development activities. FY 2019 Plans: Continue SDD support efforts for airframe, air vehicle systems, mission systems, weapons integration, mission support, and autonomic logistics development activities. FY 2020 Base Plans: N/A FY 2020 OCO Plans: N/A FY 2019 to FY 2020 Increase/Decrease Statement: FY20 funding decrease is due to reduction in domestic and International controls as SDD phase draws to closure. | 20.598 | 13.459 | 0.000 | 0.000 | 0.000 |
| Title: Autonomic Logistics Information System (ALIS) Description: SDD execution of Autonomic Logistics Information System (ALIS) develops the information infrastructure used to transmit health and maintenance action information for the aircraft to the appropriate users. FY 2019 Plans: N/A FY 2020 Base Plans: N/A FY 2020 OCO Plans: | 40.694 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604800F / F-35 - EMD | Project (Number/Name) 653831 / Joint Strike Fighter |

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| N/A | | | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: N/A | | | | | |
| Title: Other Service Funding Adjustment (F-35 JSF) Description: Balancer line | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| FY 2019 Plans: Continue SDD execution of ALIS to develop the information infrastructure used to transmit health and maintenance action information for the aircraft to the appropriate users. | | | | | |
| FY 2020 Base Plans: N/A | | | | | |
| FY 2020 OCO Plans: N/A | | | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: N/A | | | | | |
| Accomplishments/Planned Programs Subtotals | 537.672 | 196.104 | 10.828 | 0.000 | 10.828 |
| Other Service Funding Adjustment | 273.736 | 127.103 | 3.200 | - | 3.200 |
| Air Force Subtotals | 263.936 | 69.001 | 7.628 | 0.000 | 7.628 |

| C. Other Program Funding Summary (\$ in Millions) | | | | | | | | | | | |
|---|----------------|----------------|---------------------|--------------------|----------------------|----------------|----------------|----------------|----------------|-------------------------|-------------------|
| Line Item | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| • RDTE 05 PE 0604800N 2261: JSF SDD (CV) | 100.084 | 60.537 | 1.490 | - | 1.490 | 0.238 | 0.252 | 0.234 | 0.234 | 0.000 | 163.069 |
| • RDTE 05 PE 0604800N 3352: F-35C Sustainment/ Capability Enhancements (CV) | 5.564 | 4.957 | - | - | - | - | - | - | - | 0.000 | 10.521 |
| • RDTE 05 PE 0604800M 2262: JSF SDD (STOVL) | 146.202 | 66.566 | 1.710 | - | 1.710 | 0.540 | 0.556 | 0.567 | 0.578 | 0.000 | 216.719 |
| • RDTE 05 PE 0604800M 3350: F-35B Sustainment/ | 10.960 | - | - | - | - | - | - | - | - | 0.000 | 10.960 |

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|---|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604800F / F-35 - EMD | Project (Number/Name) 653831 / Joint Strike Fighter |
|--|--|---|

C. Other Program Funding Summary (\$ in Millions)

| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> <u>Base</u> | <u>FY 2020</u> <u>OCO</u> | <u>FY 2020</u> <u>Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To</u> <u>Complete</u> | <u>Total Cost</u> |
|---|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|
| <i>Capability Enhancements (STOVL), BPAC 3350</i> | | | | | | | | | | | |
| • RDTE International 1: International SDD | 27.450 | 0.000 | - | - | - | - | - | - | - | 0.000 | 27.450 |

Remarks

D. Acquisition Strategy

The SDD program consists of a cost-reimbursement contract awarded to Lockheed Martin Aeronautics Company to develop the F-35 Air System, consisting of three aircraft variants and its associated logistics support system, for the U.S. Services and international participants. Similarly, a cost-reimbursement contract was awarded to Pratt & Whitney to develop the F135 propulsion system. Ground and flight testing will be conducted during development to accomplish validation and verification, with the extensive use of modeling and simulation to offset the risk of this large, complex, and concurrent lifecycle program. A comprehensive logistics support environment, including an integrated training system for aircrew, maintenance, and support personnel, is also being developed.

On 25 April 2011, the Department of Defense terminated the development of the General Electric Rolls-Royce Fighter Engine Team F136 propulsion system.

The F-35 Program has made international involvement a key element of the acquisition strategy. This includes international partnership in the development, production, and sustainment phases of the lifecycle. Additional international participation includes Foreign Military Sales arrangements.

In Fiscal Year (FY) 2007, separate cost-type contracts were awarded to Lockheed Martin Aeronautics Company and Pratt & Whitney to begin low rate initial production for F-35 air vehicles, propulsion systems, and sustainment for the fielded systems. Transition to fixed-price-type procurement contracts occurred with the fourth low rate lot. To provide logistics support for delivered aircraft, Performance-Based Logistics cost-type contracts will be awarded to Lockheed Martin Aeronautics Company and Pratt & Whitney.

At the completion of Low Rate Initial Production, a Defense Acquisition Board review, and Milestone Decision Authority approval, the F-35 Program will enter Full Rate Production. Fixed-price procurement contracts will be awarded for F-35 air vehicles and propulsion systems for the U.S. Services and international participants. Multiyear procurement authority for the F-35 Air System will be requested for Full Rate Production. Concurrently, multiple-year, fixed-price-type Performance Based Logistics contracts for sustainment will be requested to support multi-Service and multi-national requirements.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|---|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604800F / F-35 - EMD | Project (Number/Name) 653831 / Joint Strike Fighter |
|--|--|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Lockheed Martin - SDD | SS/CPIF | Lockheed Martin : Ft. Worth, TX | 32,030.502 | 348.078 | Dec 2017 | 96.560 | Dec 2018 | 10.828 | Dec 2019 | - | | 10.828 | 9.182 | 32,495.150 | 32,501.514 |
| Lockheed Martin - SDD Fee | SS/CPIF | Lockheed Martin : Ft. Worth, TX | 1,738.689 | 6.354 | Dec 2017 | 9.150 | Dec 2018 | 0.000 | | - | | 0.000 | 0.000 | 1,754.193 | 1,754.193 |
| Lockheed Martin -0031 | SS/CPFF | Lochkheed Martin : Ft. Worth, TX | 462.538 | 40.694 | Dec 2017 | 0.000 | Dec 2018 | - | | - | | - | 0.000 | 503.232 | 503.232 |
| Lockheed Martin - BOA 0020 | SS/CPFF | Lockheed Martin : Ft. Worth, TX | 0.843 | 0.169 | Dec 2017 | - | | - | | - | | - | 0.000 | 1.012 | 1.012 |
| Lockheed Martin - BOA 0016 | SS/CPFF | Lockheed Martin : Ft. Worth, TX | 221.119 | 9.813 | Dec 2017 | - | | - | | - | | - | 0.000 | 230.932 | 230.932 |
| Pratt & Whitney - SDD | SS/CPIF | Pratt &Whitney : Hartford, CT | 7,401.776 | 11.220 | Jan 2018 | - | | - | | - | | - | 0.000 | 7,412.996 | 7,412.996 |
| Pratt & Whitney - Fee | SS/CPIF | Pratt &Whitney : Hartford, CT | 692.198 | 1.800 | Sep 2018 | - | | - | | - | | - | 0.000 | 693.998 | 693.998 |
| Systems Engineering | Various | Various : Various | 458.948 | 0.911 | Dec 2017 | - | | - | | - | | - | 0.000 | 459.859 | 459.859 |
| Prime LM 02-C-3002 ALIS | SS/CPAF | LM : Ft Worth, TX | 2,909.122 | 0.000 | | - | | - | | - | | - | 0.000 | 2,909.122 | 2,909.122 |
| Subtotal | | | 45,915.735 | 419.039 | | 105.710 | | 10.828 | | - | | 10.828 | 9.182 | 46,460.494 | N/A |

Remarks
 Contract type prior to 2013 was CPAF.
 Cumulative Award Fee earned in prior years for Lockheed Martin is 97%.
 Cumulative Award Fee earned in prior years for Pratt and Whitney is 98%.

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|-------------------------------------|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| AFFTC/Eglin | Various | Various : Various | 140.760 | 0.830 | Nov 2017 | - | | - | | - | | - | 0.000 | 141.590 | 141.590 |
| Miscellaneous | Various | Various : Various | 135.872 | 12.855 | Nov 2017 | 12.480 | Nov 2018 | - | | - | | - | 0.000 | 161.207 | 161.207 |
| NAWC Patuxent River | Various | NAWC AD : Patuxent River, MD | 547.210 | 6.913 | Nov 2017 | - | | - | | - | | - | 0.000 | 554.123 | 554.123 |
| Prior Year no longer funded in FYDP | Various | Various : Various | 527.808 | - | | - | | - | | - | | - | 0.000 | 527.808 | 527.808 |

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|---|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604800F / F-35 - EMD | Project (Number/Name) 653831 / Joint Strike Fighter |
|--|--|---|

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---------------------------------|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Subtotal | | | 1,351.650 | 20.598 | | 12.480 | | - | | - | | - | 0.000 | 1,384.728 | N/A |

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| NAWC China Lake | Various | NAWC WD : China Lake, CA | 43.257 | - | | 0.004 | | - | | - | | - | 0.000 | 43.261 | - |
| Development Test and Evaluation | Various | NAWC AD : Patuxent River, MD | 807.112 | 4.400 | Nov 2017 | 0.051 | | - | | - | | - | 0.000 | 811.563 | - |
| Edwards AFB | Various | Edwards AFB : Edwards AFB, CA | 738.919 | 4.400 | Nov 2017 | 0.045 | | - | | - | | - | 0.000 | 743.364 | - |
| Other (including Classified PIDs) | Various | Various : Various | 271.874 | 2.400 | Nov 2017 | - | | - | | - | | - | 0.000 | 274.274 | - |
| OT - AFOTEC/AFFTC | Various | OT AFOTEC/ AFFTC : Various | 239.981 | 61.610 | Nov 2017 | 0.000 | | - | | - | | - | 0.000 | 301.591 | - |
| OT - JITC/OPTEV | Various | OT JITC/OPTEV : Various | 104.199 | 19.609 | Nov 2017 | 0.000 | | - | | - | | - | 0.000 | 123.808 | - |
| OT - Various | Various | Various : Various | 10.598 | 5.528 | Nov 2017 | 77.726 | Nov 2018 | - | | - | | - | 0.000 | 93.852 | - |
| Prior Year no longer funded in FYDP | Various | Various : TBD | 41.740 | - | | - | | - | | - | | - | 0.000 | 41.740 | - |
| Subtotal | | | 2,257.680 | 97.947 | | 77.826 | | - | | - | | - | 0.000 | 2,433.453 | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Travel | C/CPAF | Various : Various | 0.493 | 0.088 | Dec 2017 | 0.088 | Oct 2018 | - | | - | | - | 0.000 | 0.669 | 0.000 |
| Prior Year not funded in FYDP | Various | Various : Various | 913.018 | - | | - | | - | | - | | - | 0.000 | 913.018 | 0.000 |
| Subtotal | | | 913.511 | 0.088 | | 0.088 | | - | | - | | - | 0.000 | 913.687 | N/A |

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604800F / F-35 - EMD | Project (Number/Name) 653831 / Joint Strike Fighter |
|--|--|---|

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--------------------------------------|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |

Remarks
Cumulative Award Fee earned in prior years for Stanley is 99%.

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|
| Cost Category Subtotals | 50,438.576 | 537.672 | 196.104 | 10.828 | - | 10.828 | 9.182 | 51,192.362 | N/A |
| Other Service Funding Adjustment | - | 273.736 | 127.103 | 3.200 | - | 3.200 | | | - |
| Project Cost Totals | 50,438.576 | 263.936 | 69.001 | 7.628 | - | 7.628 | 9.182 | 51,192.362 | - |

Remarks
The project information shown here reflects USN, USMC, USAF and International Partner funding total for each contract. By agreement USN and USMC funding shares are approximately equal and when combined are equal to the USAF share.

NOTE 1: Prior Years reflect \$21,988.772M USAF/\$19,801.023M USN/\$3,662.768M USMC /\$4,986.013M International/Total \$50,438.576M
 FY 2018 reflects \$263.936M USAF/\$100.084M USN/\$146.202M USMC/\$27.45M International/Total \$537.672M
 FY 2019 reflects \$ 69.001M USAF/\$ 60.537M USN/\$ 66.566M USMC/Total \$196.104M
 FY 2020 reflects \$ 7.628M USAF/\$ 1.490M USN/\$ 1.710M USMC/Total \$10.828M

JSF EMD Includes:
 USAF PE 0604800F BPAC 653831
 USN PE 0604800N Project Unit 2261
 USMC PE 0604800M Project Unit 2262

D&S Includes:
 USAF PE 0604800F BPAC 653832
 USN PE 0604800N Project Unit 3352
 USMC PE 0604800M Project Unit 3350

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force **Date:** February 2019

| | | |
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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604800F / F-35 - EMD | Project (Number/Name) 653831 / Joint Strike Fighter |
|--|--|---|

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
|--|---|
| JSF Variants - CV, STOVL & CTOL | |
| Acquisition Milestones: F-35C Initial Operational Capability | █ |
| Test & Evaluation: Test and Evaluation: Block 3F DT&E/Cert | █ |
| Test & Evaluation: Test and Evaluation: Initial Operational Test and Evaluation (IOT&E) | █ |
| Defense Acquisition Reviews: System Development Reviews: Interim Program Review (IPR) FY18 | █ |
| Defense Acquisition Reviews: System Development Reviews: Interim Program Review (IPR) FY19 | █ |
| Defense Acquisition Reviews: System Development Reviews: Interim Program Review (IPR) FY20 | █ |
| Defense Acquisition Reviews: System Development Reviews: Interim Program Review (IPR) FY21 | █ |
| Production Lots (Full Funding / Production / Delivery: U.S. Aircraft): LOT 10 Full Funding / Production / Delivery | █ |
| Production Lots (Full Funding / Production / Delivery: U.S. Aircraft): LOT 11 Full Funding / Production / Delivery | █ |
| Production Lots (Full Funding / Production / Delivery: U.S. Aircraft): LOT 12 Full Funding / Production / Delivery | █ |

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force **Date:** February 2019

| | | |
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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604800F / F-35 - EMD | Project (Number/Name) 653831 / Joint Strike Fighter |
|--|--|---|

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | | | | | |
|--|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|--|--|--|--|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | | | | |
| Production Lots (Full Funding / Production / Delivery: U.S. Aircraft): LOT 13 Full Funding / Production / Delivery | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Production Lots (Full Funding / Production / Delivery: U.S. Aircraft): LOT 14 Full Funding / Production / Delivery | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Production Lots (Full Funding / Production / Delivery: U.S. Aircraft): LOT 15 Full Funding / Production / Delivery | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Production Lots (Full Funding / Production / Delivery: U.S. Aircraft): LOT 16 Full Funding / Production / Delivery | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|---|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604800F / F-35 - EMD | Project (Number/Name) 653831 / Joint Strike Fighter |
|--|--|---|

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>JSF Variants - CV, STOVL & CTOL</i> | | | | |
| Acquisition Milestones: F-35C Initial Operational Capability | 2 | 2019 | 2 | 2019 |
| Test & Evaluation: Test and Evaluation: Block 3F DT&E/Cert | 1 | 2018 | 2 | 2018 |
| Test & Evaluation: Test and Evaluation: Initial Operational Test and Evaluation (IOT&E) | 1 | 2019 | 1 | 2020 |
| Defense Acquisition Reviews: System Development Reviews: Interim Program Review (IPR) FY18 | 1 | 2019 | 1 | 2019 |
| Defense Acquisition Reviews: System Development Reviews: Interim Program Review (IPR) FY19 | 1 | 2020 | 1 | 2020 |
| Defense Acquisition Reviews: System Development Reviews: Interim Program Review (IPR) FY20 | 1 | 2021 | 1 | 2021 |
| Defense Acquisition Reviews: System Development Reviews: Interim Program Review (IPR) FY21 | 1 | 2022 | 1 | 2022 |
| Production Lots (Full Funding / Production / Delivery: U.S. Aircraft): LOT 10 Full Funding / Production / Delivery | 2 | 2018 | 2 | 2019 |
| Production Lots (Full Funding / Production / Delivery: U.S. Aircraft): LOT 11 Full Funding / Production / Delivery | 2 | 2019 | 1 | 2020 |
| Production Lots (Full Funding / Production / Delivery: U.S. Aircraft): LOT 12 Full Funding / Production / Delivery | 2 | 2020 | 1 | 2021 |
| Production Lots (Full Funding / Production / Delivery: U.S. Aircraft): LOT 13 Full Funding / Production / Delivery | 2 | 2021 | 1 | 2022 |
| Production Lots (Full Funding / Production / Delivery: U.S. Aircraft): LOT 14 Full Funding / Production / Delivery | 2 | 2022 | 4 | 2023 |
| Production Lots (Full Funding / Production / Delivery: U.S. Aircraft): LOT 15 Full Funding / Production / Delivery | 2 | 2023 | 4 | 2023 |

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|---|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604800F / F-35 - EMD | Project (Number/Name) 653831 / Joint Strike Fighter |
|--|--|---|

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| Production Lots (Full Funding / Production / Delivery: U.S. Aircraft): LOT 16 Full Funding / Production / Delivery | 2 | 2023 | 2 | 2024 |

Note
Schedule details reflect fiscal years

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|---|--------------------|----------------|----------------|---------------------|--|----------------------|----------------|----------------|--|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 5 | | | | | R-1 Program Element (Number/Name) PE 0604800F / F-35 - EMD | | | | Project (Number/Name) 653832 / JSF DEPLOYABILITY AND SUITABILITY ENHANCEMENT | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 653832: JSF DEPLOYABILITY AND SUITABILITY ENHANCEMENT | 0.000 | 18.190 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 18.190 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

Note

Total cost including United States Navy (USN), United States Marine Corps (USMC), United States Air Force (USAF) funding and International Partner contributions to D&S is: FY2016 \$184.378M, FY2017 \$125.862M, FY2018 \$42.258M and FY2019 \$4.957M

R-2A (section B)/R-3 displays total combined program (i.e. not Service-specific), including International partners.

D&S Includes:

- USAF PE 0604800F BPAC 653832
- USN PE 0604800N Project Unit 3352
- USMC PE 0604800M Project Unit 3350

A. Mission Description and Budget Item Justification

Funds enhancements to the Deployability and Suitability (D&S) of the air system such as low observable (LO) maintenance enhancements, security architecture updates, redesign of obsolete items and integrated training simulators. These enhancements will provide vital on-demand support to the warfighter within a deployed environment and are not funded via the existing System Development and Demonstration (SDD) program or tied to Block 4 Operational Flight Program development. Funding will result in achieving targeted suitability, maintainability, and affordability returns employing the F-35 in deployed or austere locations.

Funding at the accomplishment/planned program level is reported as the total of all services as these activities support all aircraft variants. By agreement, USN and USMC funding shares are approximately equal and when combined are equal to the USAF share.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Title: Sustainment and Capability Enhancements (F-35 JSF) | 25.367 | 4.957 | 0.000 | 0.000 | 0.000 |
| Description: Apply disciplined systems engineering, refinement of requirements, develop and acquire suitability and maintainability of the air system such as decentralized maintenance capabilities, LO maintenance enhancements, security architecture updates, redesign of obsolete items and integrated training simulators. | | | | | |
| FY 2019 Plans: | | | | | |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604800F / F-35 - EMD | Project (Number/Name) 653832 / JSF DEPLOYABILITY AND SUITABILITY ENHANCEMENT |

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| <p>Continue to conduct systems engineering, technical maturation, integration and test planning for suitability and deployability enhancements. Conclude sustaining engineering development and test activities necessary to gain capacity, compatibility, and expansion and wiring, power, wing conduits, etc. in support of electronic warfare. This includes funding for suitability enhancements related to distributed mission training (DMT).</p> <p>FY 2020 Base Plans: N/A</p> <p>FY 2020 OCO Plans: N/A</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY20 sustainment/capability enhancements funding decrease is do to reduction in domestic and international controls in conjunction with SDD phase drawing to closure.</p> | | | | | |
| <p>Title: Development Support (F-35 JSF)</p> <p>Description: SDD support efforts for airframe, air vehicle systems, mission systems, weapons integration, mission support, and autonomic logistics development activities.</p> <p>FY 2019 Plans: No funding requested in FY19.</p> <p>FY 2020 Base Plans: N/A</p> <p>FY 2020 OCO Plans: N/A</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: N/A</p> | 1.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| <p>Title: Development Test and Evaluation</p> <p>Description: Verification and testing for deployability and suitability enhancements.</p> <p>FY 2019 Plans: No funding requested in FY19.</p> <p>FY 2020 Base Plans:</p> | 0.500 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604800F / F-35 - EMD | Project (Number/Name) 653832 / JSF DEPLOYABILITY AND SUITABILITY ENHANCEMENT |

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| N/A FY 2020 OCO Plans: N/A FY 2019 to FY 2020 Increase/Decrease Statement: N/A | | | | | |
| Title: Autonomic Logistics Information System Description: SDD execution of Autonomic Logistics Information System (ALIS) develops the information infrastructure used to transmit health and maintenance action information for the aircraft to the appropriate users. FY 2019 Plans: No funding requested in FY19. FY 2020 Base Plans: N/A FY 2020 OCO Plans: N/A FY 2019 to FY 2020 Increase/Decrease Statement: N/A | 14.728 | 0.000 | 0.000 | 0.000 | 0.000 |
| Title: Other Program Funding (F-35 JSF) Description: NOTE: Balancer line since the R2A/R3 represents a joint budget. FY 2019 Plans: No funding requested in FY19. FY 2020 Base Plans: N/A FY 2020 OCO Plans: N/A FY 2019 to FY 2020 Increase/Decrease Statement: | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604800F / F-35 - EMD | Project (Number/Name) 653832 / JSF DEPLOYABILITY AND SUITABILITY ENHANCEMENT |

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| N/A | | | | | |
| Accomplishments/Planned Programs Subtotals | 41.595 | 4.957 | 0.000 | 0.000 | 0.000 |
| Other Service Funding Adjustment | 23.405 | 4.957 | - | - | - |
| Air Force Subtotals | 18.190 | 0.000 | 0.000 | 0.000 | 0.000 |

C. Other Program Funding Summary (\$ in Millions)

| Line Item | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|--|----------------|----------------|---------------------|--------------------|----------------------|----------------|----------------|----------------|----------------|-------------------------|-------------------|
| • RDTE 05 PE 0604800F 3831: JSF SDD, BPAC 653831 | 263.936 | 69.001 | 7.628 | - | 7.628 | 5.434 | 0.013 | 0.000 | 0.000 | 0.000 | 346.012 |
| • RDTE 05 PE 0604800N 2261: JSF SDD (CV) | 100.084 | 60.537 | 1.490 | - | 1.490 | 0.238 | 0.252 | 0.234 | 0.234 | 0.000 | 163.069 |
| • RDTE 05 PE 0604800N 3352: F-35C Sustainment/ Capability Enhancements (CV) | 5.564 | 4.957 | 0.000 | - | 0.000 | - | - | - | - | 0.000 | 10.521 |
| • RDTE 05 PE 0604800M 2262: JSF SDD (STOVL) | 146.202 | 66.566 | 1.710 | - | 1.710 | 0.540 | 0.556 | 0.567 | 0.578 | 0.000 | 216.719 |
| • RDTE 05 PE 0604800M 3350: F-35B Sustainment/ Capability Enhancements (STOVL), BPAC 3350 | 10.960 | 0.000 | - | - | - | - | - | - | - | 0.000 | 10.960 |
| • RDTE International 1: International SDD | 27.450 | 0.000 | - | - | - | - | - | - | - | 0.000 | 27.450 |

Remarks

This is a joint program with no executive service. Service Acquisition Executive (SAE) authority alternates between the Department of the Navy and the Department of the Air Force and currently resides with the Air Force. Program Element 0604800N/0604800M continues USN development efforts budgeted in 0603800N prior to FY2002. The United Kingdom, Italy, Netherlands, Turkey, Canada, Australia, Denmark, and Norway are participants in the SDD phase of JSF.

Note: The USAF/USN/USMC procurement lines include Aircraft Procurement and Advanced Procurement only. Initial Spares and Repair Parts for all Services are reflected in separate lines. International Partner Funding also includes funds provided under the Italy and Netherlands Bilateral agreements.

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604800F / F-35 - EMD | Project (Number/Name) 653832 / JSF DEPLOYABILITY AND SUITABILITY ENHANCEMENT |

C. Other Program Funding Summary (\$ in Millions)

| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> <u>Base</u> | <u>FY 2020</u> <u>OCO</u> | <u>FY 2020</u> <u>Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To</u> <u>Complete</u> | <u>Total Cost</u> |
|--|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|
| RELATED RDT&E: Funding prior to JSF SDD (FY94-FY01): USN PE 0603800N \$1,950.617M; USAF PE 0603800F \$1,907.352M; DARPA PE 0603800E \$118.056M; and International Partner contributions of \$253.921M for a total of \$4,229.946M. | | | | | | | | | | | |

D. Acquisition Strategy

Implement JSF Joint Executive Steering Board (JESB)/Configuration Steering Board (CSB) approved enhancements through existing contracts using the engineering change proposal process. When appropriate, new cost type contracts may be established.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|--|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604800F / F-35 - EMD | Project (Number/Name) 653832 / JSF DEPLOYABILITY AND SUITABILITY ENHANCEMENT |
|--|--|--|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|----------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Primary Hardware Development - 3002 SDD | SS/CPFF | Lockheed Martin : Fort Worth, TX | 0.000 | 22.992 | Mar 2018 | 4.957 | Mar 2019 | - | | - | | - | 4.995 | 32.944 | 105.824 |
| Primary Hardware Development - 3002 ALIS | SS/CPFF | Lockheed Martin : Fort Worth, TX | 0.000 | 14.728 | Mar 2018 | - | | - | | - | | - | 0.000 | 14.728 | 209.271 |
| Primary Hardware Development - 14-C-0002 Band 2/5 | SS/CPFF | Lockheed Martin : Fort Worth, TX | 0.000 | 2.375 | Mar 2018 | - | | - | | - | | - | 0.000 | 2.375 | 122.925 |
| Subtotal | | | 0.000 | 40.095 | | 4.957 | | - | | - | | - | 4.995 | 50.047 | N/A |

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---------------------------------|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Development Support | Various | AFLCMC : Eglin AFB, FL | 0.000 | - | | - | | - | | - | | - | 0.000 | 0.000 | - |
| Various | Various | Various : Various, NV | 0.000 | 1.000 | Mar 2018 | - | | - | | - | | - | 0.000 | 1.000 | - |
| Subtotal | | | 0.000 | 1.000 | | - | | - | | - | | - | 0.000 | 1.000 | N/A |

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Developmental Test & Evaluation | WR | Various : Various, NV | 0.000 | 0.500 | Mar 2018 | - | | - | | - | | - | 0.000 | 0.500 | - |
| Subtotal | | | 0.000 | 0.500 | | - | | - | | - | | - | 0.000 | 0.500 | N/A |

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|--|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604800F / F-35 - EMD | Project (Number/Name) 653832 / JSF DEPLOYABILITY AND SUITABILITY ENHANCEMENT |
|--|--|--|

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Other Service Funding Adjustment | TBD | Not specified : TBD | 0.000 | 0.000 | | - | | - | | - | | - | 0.000 | 0.000 | - |
| Program Management | Various | Various : Various, NV | 0.000 | - | | - | | - | | - | | - | 0.000 | 0.000 | - |
| Subtotal | | | 0.000 | 0.000 | | - | | - | | - | | - | 0.000 | 0.000 | N/A |

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|
| Cost Category Subtotals | 0.000 | 41.595 | 4.957 | - | - | - | 4.995 | 51.547 | N/A |
| Other Service Funding Adjustment | - | 23.405 | 4.957 | - | - | - | | | - |
| Project Cost Totals | 0.000 | 18.190 | 0.000 | - | - | - | 4.995 | 51.547 | - |

Remarks
 NOTE: Prior Years reflect \$201.397M USAF/\$92.036M USN/\$82.175M USMC/\$88.669M International/Total \$464.307M
 FY 2018 reflects \$18.190M USAF/\$ 5.564M USN/\$10.960M USMC/\$ 6.881M International/Total \$ 41.595M
 FY 2019 reflects \$ 0.000M USAF/\$ 4.957M USN/\$ 0.000M USMC/\$ 0.000M International/Total \$ 4.957M
 FY 2020 reflects \$ 0.000M USAF/\$ 0.000M USN/\$ 0.000M USMC/\$ 0.000M International/Total \$ 0.000M

R-2A (section B)/R-3 displays total combined program (i.e. not Service-specific), including International partners.

JSF EMD Includes:
 USAF PE 0604800F BPAC 653831
 USN PE 0604800N Project Unit 2261
 USMC PE 0604800M Project Unit 2262

D&S Includes:
 USAF PE 0604800F BPAC 653832
 USN PE 0604800N Project Unit 3352
 USMC PE 0604800M Project Unit 3350

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604800F / F-35 - EMD | Project (Number/Name) 653832 / JSF DEPLOYABILITY AND SUITABILITY ENHANCEMENT |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|--|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| <i>F-35 Deployability and Suitability</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| D&S: Standard Operating Unit (SOUv2) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| D&S: Band 2/5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| D&S: Security Architecture | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| D&S: Offboard Mission Support (OMS) Redesign | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| D&S: Distributed Mission Training/Distributed Mission Operations (DMT/DMO) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604800F / F-35 - EMD | Project (Number/Name) 653832 / JSF DEPLOYABILITY AND SUITABILITY ENHANCEMENT |

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>F-35 Deployability and Suitability</i> | | | | |
| D&S: Standard Operating Unit (SOUv2) | 1 | 2018 | 4 | 2018 |
| D&S: Band 2/5 | 1 | 2018 | 3 | 2018 |
| D&S: Security Architecture | 1 | 2018 | 3 | 2019 |
| D&S: Offboard Mission Support (OMS) Redesign | 1 | 2018 | 4 | 2019 |
| D&S: Distributed Mission Training/Distributed Mission Operations (DMT/DMO) | 1 | 2018 | 4 | 2019 |

Note

Schedule details reflect fiscal years

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force / BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0604932F / <i>Long Range Standoff Weapon</i> |
|---|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|-------------------------------------|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | 128.767 | 437.521 | 664.920 | 712.539 | 0.000 | 712.539 | 475.297 | 359.301 | 396.032 | 433.000 | 975.320 | 4,582.697 |
| 657011: <i>LONG RANGE STAND-OFF</i> | 128.767 | 437.521 | 664.920 | 712.539 | 0.000 | 712.539 | 475.297 | 359.301 | 396.032 | 433.000 | 975.320 | 4,582.697 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | - | - |

Program MDAP/MAIS Code: 489

A. Mission Description and Budget Item Justification

The Long Range Standoff (LRSO) Cruise Missile is a long range survivable standoff weapon capable of delivering lethal nuclear effect on strategic targets. LRSO will replace the currently fielded Air Launched Cruise Missile (ALCM) and will be integrated on both legacy and future bomber aircraft. The LRSO weapon system will be capable of penetrating and surviving advanced Integrated Air Defense Systems (IADS) from significant stand-off range to prosecute strategic targets in support of the Air Force's global attack capability and strategic deterrence core function.

Funds may be used to address emerging or short-notice Diminishing Manufacturing and Material Shortage (DMSMS) issues.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver LRSO capabilities. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, 0605898F, and 0605833F.

This program is conducting activities associated with engineering and manufacturing development tasks aimed at meeting validated requirements during the technology maturation and risk reduction phase.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force</i> / BA 5: <i>System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0604932F / <i>Long Range Standoff Weapon</i> |
|--|---|

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 451.290 | 614.920 | 722.539 | 0.000 | 722.539 |
| Current President's Budget | 437.521 | 664.920 | 712.539 | 0.000 | 712.539 |
| Total Adjustments | -13.769 | 50.000 | -10.000 | 0.000 | -10.000 |
| • Congressional General Reductions | -0.178 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 50.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -15.691 | 0.000 | | | |
| • Other Adjustments | 2.100 | 0.000 | -10.000 | 0.000 | -10.000 |

Congressional Add Details (\$ in Millions, and Includes General Reductions)

Project: 657011: *LONG RANGE STAND-OFF*

Congressional Add: *Conduct LRSO Weapon Development activities*

Congressional Add Subtotals for Project: 657011

Congressional Add Totals for all Projects

| | FY 2018 | FY 2019 |
|--|----------------|----------------|
| | 0.000 | 50.000 |
| | 0.000 | 50.000 |
| | 0.000 | 50.000 |

Change Summary Explanation

FY18: -\$0.178M for FFRDC Reductions; -\$15.691M for SBIR; \$2.1M BTR from B61

FY19: Congressional Add for \$50M

FY20: -\$10.000 realigned for higher AF priorities

C. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| Title: LRSO Weapon Development | 373.607 | 506.018 | 679.656 |
| Description: Conduct LRSO Weapon Development activities | | | |
| FY 2019 Plans: Continue Prime TMRR contracts. LRSO will continue to design, develop, integrate and test the LRSO system. The Preliminary Design Review will be conducted to ensure the design adequately meets the warfighter's performance requirements in the draft Capabilities Development Document, System Requirements document, and TMRR contracts. Robust systems engineering | | | |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | | R-1 Program Element (Number/Name) PE 0604932F / <i>Long Range Standoff Weapon</i> | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| <p>will ensure the USAF owns the technical baseline for requirements traceability as well as reliability, manufacturability, and maintainability.</p> <p>FY 2020 Plans: Continue Prime TMRR contracts. LRSO will continue to design, develop, integrate and test the LRSO system. The program will continue to evaluate designs to ensure they adequately meet the warfighter's performance requirements in preparation for the interim design review. Robust systems engineering will ensure the USAF owns the technical baseline for requirements traceability as well as reliability, manufacturability, and maintainability.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY20 reflects an increase in funding as TMRR activities by both prime contractors are expected to peak in FY20.</p> | | | | |
| <p>Title: All-Up-Round</p> <p>Description: Conduct All-Up-Round activities to support weapon development</p> <p>FY 2019 Plans: Continue program practices that ensure the following are met: requirements flow down, requirement allocation to hardware and software, requirements compliance matrix, system performance, reliability, maintainability, product assurance, testability, producibility and supportability. Continue facility and security infrastructure upgrades to enable secure connectivity and communication between Department of Defense (DoD), Department of Energy (DOE), and industry. Continue efforts to conduct parallel development, design, and test activities with the DOE to ensure the LRSO adequately integrates the DOE designed warhead into the system. Continue to perform Aircraft Integration efforts including activities associated with integration on threshold aircraft and aircraft mission planning system upgrades to accommodate the new weapon. Furthermore, these efforts include activities related to weapon design compatibility with both threshold and objective aircraft. Other activities falling under these efforts include: developing mission planning upgrade needs, OFP development and integration to deliver the OFP test tapes, planning activities necessary to integrate LRSO with aircraft using MIL STD 1760D based aircraft/store interface, and ensuring the logical, electrical, and physical interfaces of the LRSO as defined in the ICD.</p> <p>FY 2020 Plans: Continue program practices that ensure the following are met: requirements flow down, requirement allocation to hardware and software, requirements compliance matrix, system performance, reliability, maintainability, product assurance, testability, producibility and supportability. Continue facility and security infrastructure upgrades to enable secure connectivity and communication between Department of Defense (DoD), Department of Energy (DOE), and industry. Continue efforts to conduct parallel development, design, and test activities with the DOE to ensure the LRSO adequately integrates the DOE designed warhead into the system. Conduct initial safety study as part of nuclear certification activities. Continue to perform Aircraft Integration efforts including activities associated with integration on threshold aircraft and aircraft mission planning system</p> | | 23.136 | 47.581 | 16.226 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | | R-1 Program Element (Number/Name) PE 0604932F / <i>Long Range Standoff Weapon</i> | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| <p>upgrades to accommodate the new weapon. Furthermore, these efforts include activities related to weapon design compatibility with both threshold and objective aircraft. Other activities falling under these efforts include: developing mission planning upgrade needs, OFP development and integration to deliver the OFP test tapes, planning activities necessary to integrate LRSO with aircraft using MIL STD 1760D based aircraft/store interface, and ensuring the logical, electrical, and physical interfaces of the LRSO as defined in the ICD.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Increase in FY19 to ensure secure infrastructure developed and in place. FY20 funds ramp down with facility and security upgrades in place and adequate to support the program.</p> | | | | |
| <p>Title: Test Support</p> <p>Description: Conduct Test Support activities to support weapon development</p> <p>FY 2019 Plans: Continue to perform Test Support efforts, including test activities and support for design validation and verification and nuclear certification, as well as system qualification (includes design and operational certification activities). Conduct fit checks. Furthermore, these efforts will continue test planning and execution activities to support LRSO weapon development, All-Up-Round technical integration, and aircraft integration.</p> <p>FY 2020 Plans: Continue to perform Test Support efforts, including test activities and support for design validation and verification and nuclear certification, as well as system qualification (includes design and operational certification activities). Perform weapon system environment testing. Furthermore, these efforts will continue test planning and execution activities to support LRSO weapon development, All-Up-Round technical integration, and aircraft integration.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Increase in FY19 to ensure secure infrastructure developed and in place at test facilities. FY20 funds ramp down with facility and security upgrades in place and adequate to support weapon system testing.</p> | | 40.778 | 61.321 | 16.657 |
| Accomplishments/Planned Programs Subtotals | | 437.521 | 614.920 | 712.539 |
| | | FY 2018 | FY 2019 | |
| Congressional Add: Conduct LRSO Weapon Development activities | | 0.000 | 50.000 | |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0604932F / <i>Long Range Standoff Weapon</i> |
|---|---|

| | FY 2018 | FY 2019 |
|---|---------|---------|
| FY 2018 Accomplishments: Conduct LRSO Weapon Development activities | | |
| FY 2019 Plans: Continue Prime TMRR contracts. LRSO will continue to design, develop, integrate and test the LRSO system. The Preliminary Design Review will be conducted to ensure the design adequately meets the warfighter's performance requirements in the draft Capabilities Development Document, System Requirements document, and TMRR contracts. Robust systems engineering will ensure the USAF owns the technical baseline for requirements traceability as well as reliability, manufacturability, and maintainability. | | |
| Congressional Adds Subtotals | 0.000 | 50.000 |

D. Other Program Funding Summary (\$ in Millions)

| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> | <u>FY 2020</u> | <u>FY 2020</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To</u> | <u>Total Cost</u> |
|--|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-----------------|-------------------|
| | | | <u>Base</u> | <u>OCO</u> | <u>Total</u> | | | | | <u>Complete</u> | <u>Total Cost</u> |
| • MILCON PE 0604932: <i>Long Range Standoff Weapon</i> | 38.000 | - | 0.000 | - | 0.000 | 0.000 | 9.628 | - | - | Continuing | Continuing |

Remarks

E. Acquisition Strategy

The acquisition strategy focuses on the development and integration of subsystem technologies with a robust reliability and manufacturing approach in a competitive environment. The program obtained a successful MS A decision in July 2016 and subsequently released a Request for Proposals. The program competitively selected two prime contractors in August 2017 to execute a 54-month Technology Maturation and Risk Reduction (TMRR) phase. The selected prime contractors will execute cost-plus-fixed-fee contracts during TMRR with activities focused on developing and maturing subsystem and system designs culminating in a final TMRR design review, delivery of Controlled Test Vehicles and conducting a vehicle configuration audit. A follow-on source selection for Engineering and Manufacturing Development (EMD) and Production phases will be conducted near the end of TMRR to select a single prime contractor to execute the EMD and Production phases of the program.

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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| Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force | | | | | | | | | | | | Date: February 2019 | | | | |
|---|------------------------|--------------------------------|-------------|--|------------|---------|------------|-------------------------------|------------|-------------|------------|---------------------|------------------|------------|--------------------------|--|
| Appropriation/Budget Activity | | | | R-1 Program Element (Number/Name) | | | | Project (Number/Name) | | | | | | | | |
| 3600 / 5 | | | | PE 0604932F / Long Range Standoff Weapon | | | | 657011 / LONG RANGE STAND-OFF | | | | | | | | |
| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | | | | |
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | Target Value of Contract | |
| Long Range Standoff Weapon Development | C/CPFF | Various : TBD | 41.976 | 352.143 | Jan 2018 | 519.331 | Jan 2019 | 652.021 | Jan 2020 | - | | 652.021 | 1,865.574 | 3,431.045 | - | |
| Subtotal | | | 41.976 | 352.143 | | 519.331 | | 652.021 | | - | | 652.021 | 1,865.574 | 3,431.045 | N/A | |
| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | | | | |
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | Target Value of Contract | |
| Material Solution Analysis Support | Various | Various : TBD | 23.525 | 0.000 | | - | | - | | - | | - | 0.000 | 23.525 | - | |
| Aircraft Integration Planning | Various | Various : TBD | 7.085 | 18.229 | Jan 2018 | 33.632 | Jan 2019 | 4.226 | Jan 2020 | - | | 4.226 | 265.613 | 328.785 | - | |
| All-Up-Round Activities | Various | Various : TBD | 6.617 | 4.907 | Feb 2018 | 13.949 | Feb 2019 | 12.000 | Feb 2020 | - | | 12.000 | 21.503 | 58.976 | - | |
| Subtotal | | | 37.227 | 23.136 | | 47.581 | | 16.226 | | - | | 16.226 | 287.116 | 411.286 | N/A | |
| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | | | | |
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | Target Value of Contract | |
| Test Support | Various | Various : TBD | 16.598 | 40.778 | Jan 2018 | 61.321 | Jan 2019 | 16.657 | Jan 2020 | - | | 16.657 | 185.110 | 320.464 | - | |
| Subtotal | | | 16.598 | 40.778 | | 61.321 | | 16.657 | | - | | 16.657 | 185.110 | 320.464 | N/A | |
| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | | | | |
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | Target Value of Contract | |
| Program Management Administration | Various | Various : TBD | 32.966 | 21.464 | Oct 2017 | 36.687 | Oct 2018 | 27.635 | Oct 2019 | - | | 27.635 | 301.150 | 419.902 | - | |
| Subtotal | | | 32.966 | 21.464 | | 36.687 | | 27.635 | | - | | 27.635 | 301.150 | 419.902 | N/A | |

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|---|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604932F / Long Range Standoff Weapon | Project (Number/Name) 657011 / LONG RANGE STAND-OFF |
|--|---|---|

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |

Remarks
FY19 PMA increase as this is a Direct Site for Civilian Pay.

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|
| Project Cost Totals | 128.767 | 437.521 | 664.920 | 712.539 | - | 712.539 | 2,638.950 | 4,582.697 | N/A |

Remarks

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|---|---|--|
| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604932F / <i>Long Range Standoff Weapon</i> | Project (Number/Name) 657011 / <i>LONG RANGE STAND-OFF</i> |

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
|--|--|
| <i>Long Range StandOff Weapon</i> | |
| Technology Maturation and Risk Reduction Phase | |
| Milestone B Decision | |
| Engineering and Manufacturing Development Phase | |
| Engineering and Manufacturing Development Contract Award | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604932F / <i>Long Range Standoff Weapon</i> | Project (Number/Name) 657011 / <i>LONG RANGE STAND-OFF</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Long Range StandOff Weapon</i> | | | | |
| Technology Maturation and Risk Reduction Phase | 1 | 2018 | 2 | 2022 |
| Milestone B Decision | 2 | 2022 | 2 | 2022 |
| Engineering and Manufacturing Development Phase | 2 | 2022 | 4 | 2024 |
| Engineering and Manufacturing Development Contract Award | 2 | 2022 | 2 | 2022 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0604933F / ICBM Fuze Modernization |
|---|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|----------------------------------|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | 515.331 | 166.571 | 167.659 | 161.199 | 0.000 | 161.199 | 132.926 | 60.016 | 2.035 | 2.071 | 0.000 | 1,207.808 |
| 655082: <i>ICBM FUZE SUPPORT</i> | 515.331 | 166.571 | 167.659 | 161.199 | 0.000 | 161.199 | 132.926 | 60.016 | 2.035 | 2.071 | 0.000 | 1,207.808 |
| Quantity of RDT&E Articles | 25 | - | - | - | - | - | - | - | - | - | - | |

Program MDAP/MAIS Code: 0498

A. Mission Description and Budget Item Justification

The ICBM Fuze Modernization Program is designing and developing a form, fit and functionally equivalent replacement for the Mk21 fuze. The legacy Mk21 fuze is three times past its design life and ongoing Mk21 fuze refurbishment does not meet Nuclear Weapon Stockpile Plan requirements. The Mk21 reentry vehicle and fuze will be deployed on the current Minuteman III (MM III) and future Ground Based Strategic Deterrent (GBSD). Previous plans to integrate and test the Mk21 replacement fuze with the U.S. Department of Energy (DOE) National Nuclear Security Administration (NNSA) W78/88-1 Life Extension Program warhead were deferred.

The US Air Force (USAF) will develop the Mk21 fuze utilizing the NNSA complex (Sandia National Labs-California [SNL-CA], Sandia National Labs-New Mexico [SNL-NM] and Kansas City National Security Campus [KCNSC], formerly Kansas City Plant) and the USAF weapons system integration contractor. The ICBM Fuze Modernization program will leverage technologies, parts, components and development/production capabilities resulting from extensive fuze work performed by the US Navy (USN) and NNSA on the Mk5 Alt 370 Fuze program. Common USN & USAF fuze components include the Radar Module (RM), Thermal Battery Assembly (TBA) and Path Length Module (PLM). USN & USAF fuze components that are partially common and use common technologies include the Missile Interface and Controller Module (MICM), Launch Safety Device (LSD), Firing Set Integration Module (FSIM) and Terminal Protection Device (TPD).

The ICBM Fuze Modernization Program will integrate the replacement fuze into MM III weapon system to include, support/test equipment, data, flight test hardware and training materials. The program will also conduct required system testing (including ground and flight tests). The program is coordinating Mk21 fuze replacement development efforts with the DOE to synchronize USAF arming and fuze development activities with DOE warhead requirements. When prudent, the program will conduct trade studies and initiate conceptual designs to address operational system issues and meet future requirements.

As a cooperative USAF, USN and NNSA acquisition, the USAF is executing the program using Department of Defense (DoD)-DOE Manual 5030.55 Joint Nuclear Weapons Life Cycle Activities (Phase 6.X process) while meeting Major Defense Acquisition Program (MDAP) statutory requirements.

The FY20 budget request continues cooperative efforts with the USN to leverage common components; continues design efforts for AF unique components; and continues development of lab, ground and flight test assets. This program also includes any needed nuclear surety and certification and system vulnerability assessments.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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|---|--|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0604933F / <i>ICBM Fuze Modernization</i> |
|---|--|

This program element may include necessary civilian pay expenses required to manage, execute, and deliver ICBM fuze weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, 0605833F, and 0605898F.

This program is entering Phase 6.4 "Production Engineering" of the 6.X process. The program will conduct production engineering tasks aimed at meeting validated requirements prior to Phase 6.5 "Low Scale Production", scheduled for FY22 (Objective).

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 178.991 | 172.902 | 161.199 | 0.000 | 161.199 |
| Current President's Budget | 166.571 | 167.659 | 161.199 | 0.000 | 161.199 |
| Total Adjustments | -12.420 | -5.243 | 0.000 | 0.000 | 0.000 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | -6.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -6.420 | 0.000 | | | |
| • FFRDC Adjustment | 0.000 | -5.243 | 0.000 | 0.000 | 0.000 |

Change Summary Explanation

FY 2018 funding reflects a below threshold reprogramming of \$6.000 million to Ground Based Strategic Deterrent (PE 0605320F) for higher Air Force priorities.

FY 2018 funding reflects a Small Business Innovation Research (SBIR) adjustment of \$6.420 million.

FY 2019 funding reflects a Federally Funded Research and Development Center (FFRDC) adjustment of \$5.243 million.

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| Title: Fuze Design and Development | 134.989 | 137.408 | 123.787 |

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|--|--|--|----------------|----------------|
| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | | R-1 Program Element (Number/Name) PE 0604933F / <i>ICBM Fuze Modernization</i> | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| <p>Description: Design and develop the Mk21 fuze required to support the ICBM W87 warhead. Coordinate design and development efforts with the ICBM weapon system integrator and support flight testing.</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none"> • Continue assessing, testing and qualifying the common components (RM, PLM, TBA) with the unique AF environments to ensure compliance to AF requirements • Continue to refine engineering and design work for the AF unique components • Conduct AF unique component Final Design Reviews • Execute Flight Test 1 and Ground Test Unit (GTU) 2 and conduct post test analysis • Prepare and complete all planning and coordination for Flight Test 2 • Finalize surveillance and sustainment strategy plans • Continue preparations for AFA Final Design Review • Begin planning for GTU 3 • Conduct Trainer Fuze Final Design Review • Begin AFA Production Process Prove-In • Prepare and conduct Lab Test Unit 3 • Baseline Design Review of Joint Test Assembly (JTA) 4a • Begin preparations for JTA4a developmental flight test <p>FY 2020 Plans:</p> <ul style="list-style-type: none"> • Continue assessing, testing and qualifying the common components (RM, PLM, TBA) with the unique AF environments to ensure compliance to AF requirements • Continue to refine engineering and design work for the AF unique components • Execute and conduct post test analysis of Flight Test 2 • Prepare and complete all planning and coordination for GTU 3 and Flight Test 3 • Continue AFA Production Process Prove-In • Begin preparation for Final Design Review of JTA4a • Continue preparations for JTA4a developmental flight test • Conduct AFA Final Design Review • Complete Engineering Release <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding decreased due to ramp down as the program prepares for Production and Deployment</p> | | | | |
| Title: Weapon System Integration/Systems Engineering | | 31.582 | 30.251 | 37.412 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|--|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0604933F / <i>ICBM Fuze Modernization</i> |
|---|--|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| <p>Description: Integrate Mk21 fuze into the MMIII weapon system. Validate designs through ground tests on an Integrated Test Bed (ITB). Plan and conduct necessary ground and flight testing. Coordinate design, development and test efforts.</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none"> • Perform test and integration on GTU 2 for mechanical environmental, electrical integration, and performance • Conduct 80% In-Process Technical Order Review • Conduct Pathfinder 1 testing • Conduct Electrical Compatibility Test 2 • Provide integration support <p>FY 2020 Plans:</p> <ul style="list-style-type: none"> • Perform test and integration on GTU 3 for mechanical environmental, electrical integration, and performance • Provide integration support • Support AFOTEC operational assessment <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding increased as program ramps up integration efforts preparing for Production and Deployment.</p> | | | |
| Accomplishments/Planned Programs Subtotals | 166.571 | 167.659 | 161.199 |

D. Other Program Funding Summary (\$ in Millions)

| Line Item | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|----------------|----------------|-------------------------|------------------------|--------------------------|----------------|----------------|----------------|----------------|-----------------------------|-------------------|
| • MPAF 03 M30FLH: <i>ICBM FUZE MOD</i> | 6.334 | 19.867 | 19.497 | - | 19.497 | 45.727 | 100.627 | 112.433 | 120.463 | 302.884 | 727.832 |

Remarks
Other Program Funding Summary reflects Advanced Procurement in FY19-24 and a continuation of life-of-type equipment buys in FY18-19, enabling the ICBM Fuze Modernization program to continue leveraging the USN design, development and production activities. Life-of-type equipment buys in FY15-17 totaled \$35.495M.

E. Acquisition Strategy
The ICBM Fuze Modernization program is executing a full cost reimbursable work-for-others agreement with the NNSA complex using SNL as the design agent and KCNSC as the production agent. The program is a collaborative effort with the USN reducing total program cost and development time by leveraging commonality between the ICBM and Submarine Launched Ballistic Missile fuze components. The USN Mk5 Alt 370 fuze is being developed first, with the USAF Mk21 fuze effort following. The USN Mk5 Alt 370 fuze entered Phase 6.3 Development Engineering in October 2012. USAF Mk21 fuze entered Phase 6.3 in August 2013. Both services participate in all design and development efforts to ensure maximum use of common components, subassemblies and technologies. Both services are using NNSA/

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force Date: February 2019

| Appropriation/Budget Activity | R-1 Program Element (Number/Name) |
|---|--|
| 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | PE 0604933F / <i>ICBM Fuze Modernization</i> |

SNL to perform fuze design and development. The USAF, as lead systems integrator for the Mk21 fuze, competed a separate weapon system integration contract for integration support to assist the government with MM III unique modifications and fuze integration efforts. Both services are using KCNSC to produce fuzes.

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|--|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604933F / ICBM Fuze Modernization | Project (Number/Name) 655082 / ICBM FUZE SUPPORT |
|--|---|--|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|-----------------------------------|--|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Fuze Preliminary Design Development | MIPR | Sandia National Labs : Albuquerque, NM | 340.836 | 89.626 | Nov 2017 | 93.961 | Nov 2018 | 95.103 | Nov 2019 | - | | 95.103 | 94.315 | 713.841 | 750.625 |
| Fuze EMD | Various | Various : Various | 1.746 | - | | 0.919 | Dec 2018 | 1.025 | Dec 2019 | - | | 1.025 | 2.370 | 6.060 | 4.510 |
| Fuze Engineering Change Orders | Various | Various : Various | 0.000 | 4.175 | May 2018 | 3.106 | May 2019 | 2.354 | May 2020 | - | | 2.354 | 10.042 | 19.677 | 20.702 |
| Fuze National Security Campus (formerly Kansas City Plant) | MIPR | National Security Campus : Kansas City, MO | 53.000 | 41.188 | Nov 2017 | 40.342 | Nov 2018 | 25.305 | Nov 2019 | - | | 25.305 | 14.386 | 174.221 | 139.005 |
| Fuze Weapon System Integration - ICBM Prime | C/CPAF | Northrop Grumman : Clearfield, UT | 25.937 | - | | - | | - | | - | | - | 0.000 | 25.937 | 25.937 |
| Fuze Weapon System Integration - RS/RV Sub-System Contract (SSC) | SS/CPAF | Lockheed Martin : Valley Forge, PA | 52.942 | 16.680 | Jan 2018 | 19.642 | Jan 2019 | - | | - | | - | 0.000 | 89.264 | 96.210 |
| Fuze Weapon System Integration | TBD | TBD : TBD | 0.000 | - | | - | | 20.840 | Jan 2020 | - | | 20.840 | 20.500 | 41.340 | 41.340 |
| Fuze Nuclear Safety Cross-Check Analysis (NSCCA) | TBD | TBD : TBD | 0.000 | - | | - | | - | | - | | - | 7.945 | 7.945 | 7.945 |
| Subtotal | | | 474.461 | 151.669 | | 157.970 | | 144.627 | | - | | 144.627 | 149.558 | 1,078.285 | N/A |

Remarks

The current Fuze Weapon System Integration - RS/RV Sub-System Contract (SSC) ends in FY19 requiring a new Fuze Weapon System Integration Contract beginning in FY20.

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---------------------------------|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Fuze Engineering Support - BAH | C/FP | Booz Allen Hamilton : Clearfield, UT | 2.757 | - | | - | | - | | - | | - | 0.000 | 2.757 | 2.757 |
| Fuze Engineering Support - BAE | C/FFP | BAE : Clearfield, UT | 9.521 | 2.699 | Jul 2018 | 1.366 | Jul 2019 | 1.843 | Jul 2020 | - | | 1.843 | 29.104 | 44.533 | 47.506 |

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|--|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604933F / ICBM Fuze Modernization | Project (Number/Name) 655082 / ICBM FUZE SUPPORT |
|--|---|--|

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---------------------------------|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Subtotal | | | 12.278 | 2.699 | | 1.366 | | 1.843 | | - | | 1.843 | 29.104 | 47.290 | N/A |

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Fuze Lead Project Office Support | MIPR | AFNWC : Albuquerque, NM | 10.480 | - | | - | | - | | - | | - | 0.000 | 10.480 | 10.480 |
| Fuze Finite Element Model Validation | C/CPFF | LMTF : Little Mountain, UT | 1.843 | - | | - | | - | | - | | - | 0.000 | 1.843 | 1.843 |
| Fuze Flight Test Hardware | TBD | TBD : TBD | 0.000 | - | | - | | - | | - | | - | 0.000 | 0.000 | 8.000 |
| Fuze Flight Test Support and Evaluation | Various | Various : Various | 0.360 | 4.178 | Feb 2018 | 2.742 | Feb 2019 | 9.429 | Feb 2020 | - | | 9.429 | 9.689 | 26.398 | 36.919 |
| Subtotal | | | 12.683 | 4.178 | | 2.742 | | 9.429 | | - | | 9.429 | 9.689 | 38.721 | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Fuze Cost and Financial Management | C/FFP | Tecolote : Salt Lake City, UT | 3.695 | 1.462 | Dec 2017 | - | | - | | - | | - | 0.000 | 5.157 | 5.637 |
| Fuze FFRDC Support | MIPR | Aerospace : Los Angeles, CA | 3.590 | 1.248 | Dec 2017 | 1.134 | Feb 2019 | 1.300 | Dec 2019 | - | | 1.300 | 2.290 | 9.562 | 5.690 |
| Fuze Program Support | C/FFP | BAE : Clearfield, UT | 0.250 | 0.743 | Feb 2018 | 0.564 | Jul 2019 | 0.979 | Feb 2020 | - | | 0.979 | 2.512 | 5.048 | 5.957 |
| Fuze Program Management Administration | Various | Various : Various | 8.374 | 4.572 | Mar 2018 | 3.883 | Mar 2019 | 3.021 | Mar 2020 | - | | 3.021 | 3.895 | 23.745 | 15.347 |
| Subtotal | | | 15.909 | 8.025 | | 5.581 | | 5.300 | | - | | 5.300 | 8.697 | 43.512 | N/A |

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force Date: February 2019

| Appropriation/Budget Activity | | | | R-1 Program Element (Number/Name) | | | Project (Number/Name) | | | | | |
|-------------------------------|-------------|---------|--|---------------------------------------|--|--------------|----------------------------|---|---------------|------------------|------------|--------------------------|
| 3600 / 5 | | | | PE 0604933F / ICBM Fuze Modernization | | | 655082 / ICBM FUZE SUPPORT | | | | | |
| | Prior Years | FY 2018 | | FY 2019 | | FY 2020 Base | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
| Project Cost Totals | 515.331 | 166.571 | | 167.659 | | 161.199 | | - | 161.199 | 197.048 | 1,207.808 | N/A |

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|--|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604933F / ICBM Fuze Modernization | Project (Number/Name) 655082 / ICBM FUZE SUPPORT |
|--|---|--|

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | | | | | | | | | |
|---|----------------------|---|---|---|--|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|----------------------|---|---|---|--|---|---|---|--|--|--|--|--|--|--|--|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | | | | | | | | |
| AF ICBM Fuze Modernization Program | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Phase 6.3 Developmental Engineering | ██████████ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Life of Type Buy (LOTB) | ████████████████████ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Phase 6.4 Production Engineering | | | | | ██ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Flight Test 1 (Feb 2019) | | | | | ████ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Final Design Review [FDR] (Dec 2019) | | | | | | | | | ████ | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Flight Test 2 (Apr 2020) | | | | | | | | | | | | | ████ | | | | | | | | | | | | | | | | | | | | | | | |
| Complete Engineering Release (Jun 2020) | | | | | | | | | | | | | ████ | | | | | | | | | | | | | | | | | | | | | | | |
| Production Readiness Review (Feb 2022) | | | | | | | | | | | | | | | | | ████ | | | | | | | | | | | | | | | | | | | |
| Flight Test 3 (Mar 2022) | | | | | | | | | | | | | | | | | ████ | | | | | | | | | | | | | | | | | | | |
| Phase 6.5 Low Scale Production | | | | | | | | | | | | | | | | | | | | | ████████████████████ | | | | | | | | | | | | | | | |
| Flight Test 4 (Nov 2022) | | | | | | | | | | | | | | | | | | | | | ████ | | | | | | | | | | | | | | | |
| Phase 6.6 Full Scale Production | | | | | | | | | | | | | | | | | | | | | | | | | ██ | | | | | | | | | | | |
| First Production Unit (Apr 2023) | | | | | | | | | | | | | | | | | | | | | | | | | ████ | | | | | | | | | | | |
| Required Assets Available (Jul 2023) | | | | | | | | | | | | | | | | | | | | | | | | | ████ | | | | | | | | | | | |

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|--|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0604933F / ICBM Fuze Modernization | Project (Number/Name) 655082 / ICBM FUZE SUPPORT |
|--|---|--|

Schedule Details

| Events by Sub Project | Start | | End | |
|---|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| AF ICBM Fuze Modernization Program | | | | |
| Phase 6.3 Developmental Engineering | 1 | 2018 | 1 | 2019 |
| Life of Type Buy (LOTB) | 1 | 2018 | 4 | 2019 |
| Phase 6.4 Production Engineering | 2 | 2019 | 4 | 2022 |
| Flight Test 1 (Feb 2019) | 2 | 2019 | 2 | 2019 |
| Final Design Review [FDR] (Dec 2019) | 1 | 2020 | 1 | 2020 |
| Flight Test 2 (Apr 2020) | 3 | 2020 | 3 | 2020 |
| Complete Engineering Release (Jun 2020) | 3 | 2020 | 3 | 2020 |
| Production Readiness Review (Feb 2022) | 2 | 2022 | 2 | 2022 |
| Flight Test 3 (Mar 2022) | 2 | 2022 | 2 | 2022 |
| Phase 6.5 Low Scale Production | 4 | 2022 | 3 | 2023 |
| Flight Test 4 (Nov 2022) | 1 | 2023 | 1 | 2023 |
| Phase 6.6 Full Scale Production | 3 | 2023 | 4 | 2024 |
| First Production Unit (Apr 2023) | 3 | 2023 | 3 | 2023 |
| Required Assets Available (Jul 2023) | 4 | 2023 | 4 | 2023 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0605030F <i>I Joint Tactical Network Center (JTNC)</i> |
|---|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 0.404 | 0.000 | 2.414 | 0.000 | 2.414 | 8.182 | 8.353 | 8.504 | 8.357 | Continuing | Continuing |
| 655068: <i>Joint Tactical Radio System (JTRS)</i> | - | 0.404 | 0.000 | 2.414 | 0.000 | 2.414 | 8.182 | 8.353 | 8.504 | 8.357 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

The JTNC is responsible for ensuring interoperable, secure, and affordable waveform and wireless communications by recommending standards, conducting compliance and certification analyses in accordance with Department of Defense (DoD) policies, and maintaining a DoD Waveform Information Repository (IR). The JTNC provides: (1) DoD Waveform IR management and configuration control, (2) DoD waveform standards and Software Communications Architecture (SCA), (3) technical analyses of DoD and industry Waveform IR products, and (4) serves as Technical Advisor to the JTNC Board of Directors (BoD).

This mission is executed in conjunction with other government agencies to include the National Security Agency (NSA), the Joint Interoperability Test Command (JITC), National Telecommunication and Information Administration (NTIA), the Services, as well as industry partners. Particular attention is paid to ensuring that interagency work is collaborative and eliminates duplicative capability. The JTNC enables a common software baseline that is hardware agnostic leading to increased competition for Software Defined Radios (SDR).

The Joint Enterprise Network Manager (JENM) software provides a single network management tool for the Warfighter to plan, configure, load, and manage the Joint Services' Software Defined Radios (SDRs) and networks in the field, a capability not available in legacy planning systems. JENM configures numerous Tactical radios such as the ManPack and Rifleman, enabling them to utilize the Mobile Ad Hoc Networking (MANET) waveforms such as the Soldier Radio Waveform (SRW), Mobile User Objective System (MUOS), Satellite Communications (SATCOM) Demand Assigned Multiple Access (DAMA), Integrated Waveform (IW), and Single Channel Ground and Airborne Radio System (SINCGARS) waveforms. Furthermore, JENM provides the Commander the ability to quickly reconfigure critical networks using its' Over the Air Management (OTAM) functionality. JENM enhances the S6's ability to conduct Course of Action (COA) Analysis and the Military Decision Making Process (MDMP) providing commanders critical information regarding their ability to effectively communicate. JENM is deployed on the Joint Tactical Networking Environment NetOps Toolkit (J-TNT) from Division to the Company level based upon the Basis of Issue Plan.

As part of the joint program budget strategy for JTNC and JENM, each Military Department (MILDEP) budgets for approximately one-third of the total program RDT&E funds for joint efforts. Joint funding is held at the Navy PE 0605030N and Air Force PE 0605030F. Prior to the year of execution, the funding is consolidated in the Army PE (0605031A) for execution.

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| | |
|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0605030F / <i>Joint Tactical Network Center (JTNC)</i> |
|---|---|

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 12.736 | 0.000 | 8.038 | 0.000 | 8.038 |
| Current President's Budget | 0.404 | 0.000 | 2.414 | 0.000 | 2.414 |
| Total Adjustments | -12.332 | 0.000 | -5.624 | 0.000 | -5.624 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | -12.332 | 0.000 | -5.624 | 0.000 | -5.624 |

Change Summary Explanation

FY18 reduction due to funds RMD'd to other service and residual returned back to AF.

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| Title: Joint Tactical Networking Center (JTNC) | 0.404 | 0.000 | 2.414 | 0.000 | 2.414 |
| Description: Joint Tactical Networking Center (JTNC) aligns with the JTNC BoD, USD(AT&L), DoD Chief Information Officer (CIO), Joint Staff, the Services, and other key stakeholders for those JTNC chartered processes that ensure interoperable, secure, and cost effective waveform and wireless communications. The JTNC: (1) Facilitates the reuse of waveform and wireless communications and fosters product capability improvements by making government owned waveform and wireless communications products available to developers, (2) provides open architecture DoD Waveform Standards in support of service, multiservice, and coalition forces, (3) provides compliance and certification recommendations on wireless communications | | | | | |
| FY 2019 Plans: | | | | | |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0605030F <i>I Joint Tactical Network Center (JTNC)</i> |
|---|---|

C. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|---------|---------|--------------|-------------|---------------|
| <p>The JTNC will conduct waveform analyses of the following waveforms (based on waveform software and related technical artifact availability) to include: Commercial (Harris) - Advanced Networking Wideband Waveform (ANW2); DoD (Navy) - Mobile User Objective System (MUOS) v3.1.5.2, Link 16 Engineering Release 0G (ER0G), Second-Generation Anti-Jam Tactical UHF Radio for North Atlantic Treaty Organization (NATO) (SATURN) and the Joint Waveform (formally Uniform MEECN Mode). The JTNC will continue collecting relevant software, technical documentation, cataloging and inducting other DoD Communication Waveforms listed in the DoD Communication Waveform Inventory. The JTNC will continue to enhance the Department of Defense (DoD) Waveform Information Repository (IR) capability and Software Communications Architecture (SCA) evolution and promulgation. The JTNC will continue to evolve DoD Waveform Standards to facilitate common development, interoperability and re-use. The JTNC will support export requests and analyses of products for exportability.</p> <p>FY 2020 Base Plans: Will continue analysis of Board of Directors approved waveforms in accordance Service priorities and the FY20 JTNC Management Plan. Continue collecting relevant software, technical documentation, cataloging and inducting other DoD Communication Waveforms listed in the DoD Communication Waveform Inventory. Continue to enhance DoD Waveform IR capability and approved Standards promulgation.</p> <p>Will continue the development of the tactical communications vendor product capability characterization process for commercial off-the-shelf (COTS) and non-developmental item (NDI) tactical communication products. Continue to evolve DoD Waveform Standards to facilitate common development, interoperability and re-use, reducing product development time and facilitating faster delivery of capabilities to warfighters. Continue to conduct technical waveform and software artifact analyses against published standards. Continue to support export requests and analyses of products for exportability. Continue to certify secure, reusable software waveforms based on government controlled open architecture to encourage a competitive, cost effective, interoperable networking environment.</p> <p>FY 2020 OCO Plans: N/A</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p> | | | | | |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0605030F <i>I Joint Tactical Network Center (JTNC)</i> |
|---|---|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| FY19 reduction to \$0 is the result of Resource Management Decision (RMD) to consolidate funding within the Army PE 0605030A, as per the Joint Budget Strategy. FY20 outlay is the Air Force portion of funding subject to RMD before official PB20 locks. | | | | | |
| Accomplishments/Planned Programs Subtotals | 0.404 | 0.000 | 2.414 | 0.000 | 2.414 |

D. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

The Joint Tactical Networking Center is funded by all the Services. The Joint Funding Strategy requires each of the three Service Military Departments (MILDEPs) to budget for one-third of the total program approved requirement. Army funding in FY21 and beyond reflects only approximately one-third of total funding. Other funding is as follows (PB20 locked positions):

Navy RDTE: 0605030N, 3077. FY21 = 4,644 // FY22 = 4,741 // FY23 = 4,835 // FY24 = 4,932
 Army RDTE: 0605030A, 655030. FY21 = 5,833 // FY22 = 5,835 // FY 23 = 5,490 // FY24 = 6,847

Due to Joint Funding Strategy, there is no prior year funding for JTNC in the other Service lines. Prior to the year of execution, the JTNC funding is consolidated in Army PE 0605030A for execution. In accordance with the Joint Tactical Networking Center Charter updated and re-validated on 29 March 2016, the JTNC will remain under a Joint Budget Strategy funded by the three MILDEPs.

E. Acquisition Strategy

Joint Tactical Networking Center is classified as a Joint Support Program to Acquisition, Technology & Logistics (AT&L), DoD Chief Information Officer (CIO), and the Services. JTNC core functions as defined in the JTNC Acquisition Decision Memorandum and Charter signed on 20 January 2014 and revalidated on 29 March 2016 include: Department of Defense (DoD) Waveform Information Repository (IR) management and configuration control, DoD Waveform Standards and Software Communications Architecture (SCA), technical analyses of Government Program of Record (POR) and Industry COTS and NDI Waveform products. The services derived from these core functions reinforce an acquisition environment which ensures that interoperable, secure, and affordable joint tactical waveforms and wireless communications applications can operate in a variety of hardware transport solutions.

The FY2020 Budget supports continued development/maturation of the DoD Waveform IR, analysis of directed software and artifacts, support of the National Security Agency (NSA) Commercial Communications Security (COMSEC) Evaluation Program (CCEP), JTNC Standards Interface Control Working Group (ICWG), and continue development of the Capabilities Characterization and Tactical Communications Marketplace (CC & TCM).

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

Appropriation/Budget Activity
3600: *Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)*

R-1 Program Element (Number/Name)
PE 0605030F *Joint Tactical Network Center (JTNC)*

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0605030F / <i>Joint Tactical Network Center (JTNC)</i> | Project (Number/Name) 655068 / <i>Joint Tactical Radio System (JTRS)</i> |

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
|--|--|
| JTNC - Compliance and Certification | |
| Waveform and Wireless Product Compliance and Certification | |
| JTNC - Information Repository | |
| DoD Waveform Information Repository | |
| JTNC - Standards | |
| Evolve Waveform Standards and SCA | |
| JTNC - Analysis | |
| Analyze Waveforms and Associated Artifacts | |
| JENM | |
| JENM Development | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0605030F / <i>Joint Tactical Network Center (JTNC)</i> | Project (Number/Name) 655068 / <i>Joint Tactical Radio System (JTRS)</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>JTNC - Compliance and Certification</i> | | | | |
| Waveform and Wireless Product Compliance and Certification | 1 | 2018 | 4 | 2024 |
| <i>JTNC - Information Repository</i> | | | | |
| DoD Waveform Information Repository | 1 | 2018 | 4 | 2024 |
| <i>JTNC - Standards</i> | | | | |
| Evolve Waveform Standards and SCA | 1 | 2018 | 4 | 2024 |
| <i>JTNC - Analysis</i> | | | | |
| Analyze Waveforms and Associated Artifacts | 1 | 2018 | 4 | 2024 |
| <i>JENM</i> | | | | |
| JENM Development | 1 | 2018 | 4 | 2024 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0605031F / <i>Joint Tactical Network (JTN)</i> |
|---|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 1.331 | 0.000 | 0.000 | 0.000 | 0.000 | 3.735 | 3.813 | 3.883 | 3.441 | Continuing | Continuing |
| 655068: <i>Joint Tactical Radio System (JTRS)</i> | - | 1.331 | 0.000 | 0.000 | 0.000 | 0.000 | 3.735 | 3.813 | 3.883 | 3.441 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

The Joint Tactical Radio System (JTRS) development program is a joint program managed through the Navy's PEO for Joint Tactical Networks (PEO JTN). The JTN was formed upon the descoping of the Joint Tactical Radio System development program (PE 0604280F). JTN will provide interoperable, secure Joint Tactical Networking applications capable of operating in a variety of radio solutions to maintain and sustain an affordable, government-controlled open architecture, in support of Combatant Commanders', Services' and Coalition mission network requirements. JTN is responsible for the continuous development, delivery, and maintenance of networking waveforms and modified legacy radio waveforms that are Software Communications Architecture (SCA) compliant. SCA compliant waveforms enable interoperability and support Net-Centric operational warfare at sea, in the air and on the ground. Networking waveforms extend the Global Information Grid (GIG) to the first tactical mile and to the warfighter.

The JTN team is responsible for (1) the overall management and oversight of the Waveforms contained in the JTN repository; (2) development, validation, and evolution of a common JTN SCA; (3) development and evolution of waveform software applications for tactical radios; (4) development of software cryptographic algorithms and equipment applications (Information Assurance); (5) development and evolution of the JTN networking and network management software components, Joint Enterprise Network Manager (JENM); (6) testing and certification of JTN waveforms, network services, and network management; and, (7) full lifecycle support of waveforms and networking applications in order to maintain a robust industry base of radio vendors.

The individual services provide 1/3 each of funding to support activities of the JTN.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0605031F <i>I Joint Tactical Network (JTN)</i> |
|---|---|

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 9.319 | 0.000 | 3.676 | 0.000 | 3.676 |
| Current President's Budget | 1.331 | 0.000 | 0.000 | 0.000 | 0.000 |
| Total Adjustments | -7.988 | 0.000 | -3.676 | 0.000 | -3.676 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | -7.988 | 0.000 | -3.676 | 0.000 | -3.676 |

Change Summary Explanation

FY18 reduction due to funds RMD'd to other service and residual returned back to AF.

C. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| Title: Joint Tactical Networks (JTN) | 1.331 | 0.000 | 0.000 | 0.000 | 0.000 |
| Description: The Joint Tactical Radio System (JTRS) development program is a joint program managed through the Navy's PEO for Joint Tactical Networks (PEO JTN). The JTN was formed upon the descoping of the Joint Tactical Radio System development program (PE 0604280F). JTN will provide interoperable, secure Joint Tactical Networking applications capable of operating in a variety of radio solutions to maintain and sustain an affordable, government-controlled open architecture, in support of Combatant Commanders', Services' and Coalition mission network requirements. JTN is responsible for the continuous development, delivery, and maintenance of networking waveforms and modified legacy radio waveforms that are Software Communications Architecture (SCA) compliant. SCA compliant waveforms enable interoperability and support Net-Centric operational warfare at sea, in the air and on the ground. Networking waveforms extend the Global Information Grid (GIG) to the first tactical mile and to the warfighter | | | | | |
| FY 2019 Plans: N/A | | | | | |
| FY 2020 Base Plans: | | | | | |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0605031F <i>I Joint Tactical Network (JTN)</i> |
|---|---|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|-------------------------|------------------------|--------------------------|
| Funding provided by the Air Force is used to support activities of the Joint Tactical Network (JTN) | | | | | |
| FY 2020 OCO Plans: N/A | | | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: Funding increased because JTN support activities cost increased | | | | | |
| Accomplishments/Planned Programs Subtotals | 1.331 | 0.000 | 0.000 | 0.000 | 0.000 |

D. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

E. Acquisition Strategy

The JTRS Budget Item Justification is located in the Navy's FY 2019 President's Budget under Joint Tactical Radio System Program (PE 0605031N, BA 5). The JTRS development program is a joint program managed through the Navy's PEO for Joint Tactical Networks (PEO JTN). The JTN was formed upon the descoping of the Joint Tactical Radio System development program (PE 0604280F) in FY 2012.

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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| Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force | | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 5 | | | | R-1 Program Element (Number/Name) PE 0605031F / Joint Tactical Network (JTN) | | | | Project (Number/Name) 655068 / Joint Tactical Radio System (JTRS) | | | | | |

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Joint Tactical Networks | C/CPAF | TBD : NV | - | 1.331 | Apr 2018 | - | | 0.000 | Nov 2019 | - | | 0.000 | Continuing | Continuing | - |
| Subtotal | | | - | 1.331 | | - | | 0.000 | | - | | 0.000 | Continuing | Continuing | N/A |
| Project Cost Totals | | | - | 1.331 | | 0.000 | | 0.000 | | - | | 0.000 | Continuing | Continuing | N/A |

Remarks

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0605031F / <i>Joint Tactical Network (JTN)</i> | Project (Number/Name) 655068 / <i>Joint Tactical Radio System (JTRS)</i> |

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

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| <i>Joint Tactical Network</i> | |
| Joint Tactical Network (JTN) | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0605031F / <i>Joint Tactical Network (JTN)</i> | Project (Number/Name) 655068 / <i>Joint Tactical Radio System (JTRS)</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--------------------------------------|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Joint Tactical Network</i> | | | | |
| Joint Tactical Network (JTN) | 3 | 2018 | 4 | 2024 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0605056F / <i>Open Architecture Management</i> |
|---|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|-------------------------------------|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 0.000 | 0.000 | 30.000 | 0.000 | 30.000 | 25.000 | 25.000 | 25.000 | 25.000 | Continuing | Continuing |
| 656060: <i>Standards Management</i> | - | 0.000 | 0.000 | 30.000 | 0.000 | 30.000 | 25.000 | 25.000 | 25.000 | 25.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

The Open Architecture Management (OAM) Office (OAMO) at the Air Force Life Cycle Management Center is responsible for developing, evolving, and managing open standards. Open standards permit Department of Defense programs to reduce acquisition and life-cycle costs as well as the risks associated with development, sustainment, technology refresh, and capability upgrades of mission systems on weapon systems. The first standards the office will manage are the Open Mission Systems (OMS) Standard and the Universal Command and Control (C2) Interface (UCI) Standard, formerly known as the Unmanned Aerospace Systems (UAS) C2 Initiative.

OAMO provides funding to multiple entities, including the Air Force Research Laboratory (AFRL), the 76th Software Maintenance Group (76 SMXG), and the Massachusetts Institute of Technology - Lincoln Labs (MIT-LL) in support of standards management activities. AFRL is responsible for executing science and technology initiatives to further develop the OMS/UCI Standards. The 76 SMXG is responsible for key activities and deliverables for the OMS and UCI standards including: managing a collaboration tools environment, updating tools in the OMS/UCI Starter Kit, updating the Government critical abstraction layer, maintaining the Reference Implementation, integrating and testing the Mission Package, completing Change Package Development and Sponsorship, supporting the OMS and UCI management activities, providing support to adopting programs, and providing training and associated documentation. MIT-LL supports activities required to develop and deliver the anti-tamper (AT) standard.

Current Preplanned Product Improvements (P3I) include the development, test, and implementation of additional cybersecurity measures. The OAMO will execute other P3I initiatives as required. Other future initiatives may include activities such as specifically targeted improvements to the standards, coordination with other standardization efforts, additional and more thorough training activities, and widening the applicability of the OMS/UCI standard.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver open standards capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605829F, 0605830F, 0605831F, 0605832F, 0605898F, and 0605833F.

The Open Architecture Management Program Element is new for FY 2020. The entirety of Open Architecture Management activities transferred from a classified Air Force RDT&E Program Element to unclassified PE 0605056F, Open Architecture Management, in order to increase Congressional transparency. This is not a new start; it is an administrative realignment.

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0605056F / <i>Open Architecture Management</i> |
|---|---|

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Current President's Budget | 0.000 | 0.000 | 30.000 | 0.000 | 30.000 |
| Total Adjustments | 0.000 | 0.000 | 30.000 | 0.000 | 30.000 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 30.000 | 0.000 | 30.000 |

Change Summary Explanation

Increase in FY 2020 is due to transitioning Open Architecture Management from a classified Air Force RDT&E PE to PE 0605056F - Open Architecture Management to provide additional Congressional transparency.

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| Title: Open Architecture Management Office | 0.000 | 0.000 | 30.000 |
| Description: Accomplish all industry activities that result in the annual release of the OMS and UCI standards along with the associated documentation, including training materials. Manage government activities to support the OMS and UCI Standards. Conduct other preplanned activities to add additional capability and evolve the standards. | | | |
| FY 2019 Plans: In FY 2019 and prior, this work is being performed in a classified Air Force RDT&E PE. Additional details can be provided in an appropriate forum. | | | |
| FY 2020 Plans: | | | |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0605056F / <i>Open Architecture Management</i> |
|---|---|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|---------|---------|---------|
| <p>Continue to modify and update the existing OMS and UCI standards to widen the pool of OMS/UCI applicability, account for emerging technologies, and adjust for program specific needs. In coordination with industry partners develop annual releases of the OMS/UCI standards, develop training and implementation materials, hold annual training events, and conduct quarterly common governance boards. Coordinate and provide government owned expertise and assets to standards development efforts. Develop an annual starter kit, update tool kits, perform testing and integration activities, assist in the generation of an Anti-Tamper (AT) standard, and conduct other management and development activities. Ensure development of the standard incorporates cybersecurity considerations including message/data transfer security, cyber risk mitigation, and implementation standardization. Conduct other P3I initiatives, such as specifically targeted improvements to the standards, coordination with other standardization efforts, and additional training efforts, as required.</p> <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> FY 2020 increased compared to FY 2019 by \$30.000 million. Funding increased due to transitioning this effort from a classified Air Force RDT&E PE to PE 0605056F, Open Architecture Management, in FY 2020 to increase Congressional transparency.</p> | | | |
| Accomplishments/Planned Programs Subtotals | 0.000 | 0.000 | 30.000 |

D. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

In FY 2019 and prior, this work is being performed in a classified Air Force RDT&E PE. Additional details can be provided in an appropriate forum.

E. Acquisition Strategy

The Air Force Life Cycle Management Center's OAMO awarded a follow-on contract to continue the standards management activities conducted under a previously classified Air Force RDT&E Program Element. The contract is a cost plus fixed fee (CPFF) indefinite delivery/indefinite quantity (ID/IQ) that was awarded in December 2018. The first delivery order has a period of performance of 3 years beginning 1 January 2019.

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0605056F / <i>Open Architecture Management</i> | Project (Number/Name) 656060 / <i>Standards Management</i> |
|--|---|--|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|----------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Open Architecture Collaborative Working Group - BAE Systems | SS/CPFF | BAE Systems : Nashua, NH | - | - | | - | | 1.306 | Jan 2020 | - | | 1.306 | Continuing | Continuing | - |
| Open Architecture Collaborative Working Group - Boeing | SS/CPFF | Boeing : St. Louis, MO | - | - | | - | | 4.143 | Jan 2020 | - | | 4.143 | Continuing | Continuing | - |
| Open Architecture Collaborative Working Group - General Atomics ASI | SS/CPFF | General Atomics ASI : Poway, CA | - | - | | - | | 1.492 | Jan 2020 | - | | 1.492 | Continuing | Continuing | - |
| Open Architecture Collaborative Working Group - Collins Aerospace | SS/CPFF | Collins Aerospace : Westford, MA | - | - | | - | | 1.182 | Jan 2020 | - | | 1.182 | Continuing | Continuing | - |
| Open Architecture Collaborative Working Group - Harris Corp | SS/CPFF | Harris Corp : Clifton, NJ | - | - | | - | | 1.273 | Jan 2020 | - | | 1.273 | Continuing | Continuing | - |
| Open Architecture Collaborative Working Group - Lockheed Martin | SS/CPFF | Lockheed Martin : Fort Worth, TX | - | - | | - | | 7.556 | Jan 2020 | - | | 7.556 | Continuing | Continuing | - |
| Open Architecture Collaborative Working Group - Northrop Grumman | SS/CPFF | Northrop Grumman : Melbourne, FL | - | - | | - | | 5.241 | Jan 2020 | - | | 5.241 | Continuing | Continuing | - |
| Open Architecture Collaborative Working Group - Raytheon | SS/CPFF | Raytheon : El Segundo, CA | - | - | | - | | 2.037 | Jan 2020 | - | | 2.037 | Continuing | Continuing | - |
| Air Force Research Laboratory (AFRL) Science and Technology Initiatives | MIPR | AFRL : Various | - | - | | - | | 1.500 | Jan 2020 | - | | 1.500 | Continuing | Continuing | - |
| 76th Software Maintenance Group (76 SMXG) Development | MIPR | 76 SMXG : Tinker AFB, OK | - | - | | - | | 4.110 | Jan 2020 | - | | 4.110 | Continuing | Continuing | - |

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0605056F / <i>Open Architecture Management</i> | Project (Number/Name) 656060 / <i>Standards Management</i> |
|--|---|--|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Preplanned Product Improvements | C/CPFF | Various : TBD | - | - | | - | | 0.100 | Jan 2020 | - | | 0.100 | Continuing | Continuing | - |
| Subtotal | | | - | - | | - | | 29.940 | | - | | 29.940 | Continuing | Continuing | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|---|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Program Management Administration | Various | OAM Program Office : Wright-Patterson AFB, OH | - | - | | - | | 0.060 | Jan 2020 | - | | 0.060 | Continuing | Continuing | - |
| Subtotal | | | - | - | | - | | 0.060 | | - | | 0.060 | Continuing | Continuing | N/A |

| | | | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|--|--|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|
| Project Cost Totals | | | - | - | 0.000 | 30.000 | - | 30.000 | Continuing | Continuing | N/A |

Remarks
 In FY 2019 and prior, this work is being performed in a classified Air Force RDT&E PE.

 Additional details can be provided in appropriate forum.

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0605056F / <i>Open Architecture Management</i> | Project (Number/Name) 656060 / <i>Standards Management</i> |

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
|---|--|
| <i>Develop and Evolve Standards</i> | |
| Quarterly Governance Boards | |
| FY 2020 Annual Release of Open Mission System and Universal Command and Control Interface (OMS/UCI) Standards | |
| FY 2021 Annual Release of OMS/UCI Standards | |
| FY 2022 Annual Release of OMS/UCI Standards | |
| FY 2023 Annual Release of OMS/UCI Standards | |
| FY 2024 Annual Release of OMS/UCI Standards | |
| FY 2020 Annual Integration Event | |
| FY 2021 Annual Integration Event | |
| FY 2022 Annual Integration Event | |
| FY 2023 Annual Integration Event | |
| FY 2024 Annual Integration Event | |
| FY 2020 Annual Training Day | |
| FY 2021 Annual Training Day | |
| FY 2022 Annual Training Day | |
| FY 2023 Annual Training Day | |
| FY 2024 Annual Training Day | |
| Delivery Order 2 Preplanned Product Improvement (P3I) Deliverables | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0605056F / <i>Open Architecture Management</i> | Project (Number/Name) 656060 / <i>Standards Management</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|---|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Develop and Evolve Standards</i> | | | | |
| Quarterly Governance Boards | 1 | 2020 | 4 | 2024 |
| FY 2020 Annual Release of Open Mission System and Universal Command and Control Interface (OMS/UCI) Standards | 1 | 2020 | 1 | 2020 |
| FY 2021 Annual Release of OMS/UCI Standards | 1 | 2021 | 1 | 2021 |
| FY 2022 Annual Release of OMS/UCI Standards | 1 | 2022 | 1 | 2022 |
| FY 2023 Annual Release of OMS/UCI Standards | 1 | 2023 | 1 | 2023 |
| FY 2024 Annual Release of OMS/UCI Standards | 1 | 2024 | 1 | 2024 |
| FY 2020 Annual Integration Event | 3 | 2020 | 3 | 2020 |
| FY 2021 Annual Integration Event | 3 | 2021 | 3 | 2021 |
| FY 2022 Annual Integration Event | 3 | 2022 | 3 | 2022 |
| FY 2023 Annual Integration Event | 3 | 2023 | 3 | 2023 |
| FY 2024 Annual Integration Event | 3 | 2024 | 3 | 2024 |
| FY 2020 Annual Training Day | 4 | 2020 | 4 | 2020 |
| FY 2021 Annual Training Day | 4 | 2021 | 4 | 2021 |
| FY 2022 Annual Training Day | 4 | 2022 | 4 | 2022 |
| FY 2023 Annual Training Day | 4 | 2023 | 4 | 2023 |
| FY 2024 Annual Training Day | 4 | 2024 | 4 | 2024 |
| Delivery Order 2 Preplanned Product Improvement (P3I) Deliverables | 2 | 2021 | 3 | 2021 |

Note

In FY 2019 and prior, this work is being performed in a classified Air Force RDT&E PE.

Additional details can be provided in appropriate forum.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0605213F / <i>F-22 Modernization Increment 3.2B</i> |
|---|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|------------------------------------|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | 0.000 | 10.482 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 10.482 |
| 654785: <i>F-22 INCREMENT 3.2B</i> | 0.000 | 10.482 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 10.482 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | - | - |

Program MDAP/MAIS Code: 474

Note

All Increment 3.2B efforts and associated funding prior to FY 2013 are included in the F-22A Squadrons budget documentation, PE 0207138F and other outside funding Program Elements (PE). Prior year funding includes: PE 0207138F (FY 2004-FY 2012) \$422.4M; PE 0207163F (FY 2010-FY 2013) \$39.8M; PE 0207445F (FY 2007-FY 2010) \$39.6M; PE 0200001F (FY 2007) \$32.9M

A. Mission Description and Budget Item Justification

Increment 3.2B will integrate the newest air-to-air intercept missiles (i.e., AIM-9X and AIM-120D), further improve the Electronic Protection (EP) capability over Increment 3.2A, and enhance the F-22's geolocation capability from the Increment 3.1 baseline with the addition of Geolocation 2. Increment 3.2B will include the Enhanced Stores Management System (ESMS), as well as Common Weapon Engagement Zone (WEZ), and an Intra-Flight Datalink (IFDL) improvement to increase IFDL bandwidth and enable cooperative functions required to realize Increment 3.2B capabilities.

Increment 3.2B will develop, certify and integrate a new platform operational flight program to ensure the system interoperability and performance of all increment-level developments.

The development program includes development, studies, and analysis to enhance the air vehicle and training system to improve/enhance F-22 weapons, communications, Electronic Warfare, and Intelligence Surveillance Reconnaissance (ISR) capabilities.

Funds may be used to resolve emerging safety of flight and diminishing manufacturing sources issues, accommodate technology insertion and fulfill Federal Aviation Administration (FAA) or other mandates necessary to ensure continued aircrew safety and mission effectiveness. Additionally, this program element may include necessary civilian pay expenses required to manage, execute, and deliver F-22 weapon system capability.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver F-22 Increment 3.2B weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, and 0605898F.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0605213F / <i>F-22 Modernization Increment 3.2B</i> |
|---|--|

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 13.600 | 0.000 | 0.000 | 0.000 | 0.000 |
| Current President's Budget | 10.482 | 0.000 | 0.000 | 0.000 | 0.000 |
| Total Adjustments | -3.118 | 0.000 | 0.000 | 0.000 | 0.000 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | -2.620 | 0.000 | | | |
| • SBIR/STTR Transfer | -0.498 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Change Summary Explanation

No Significant changes

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| Title: F-22 Increment 3.2B Description: The F-22 Increment 3.2B Modernization Program consists of the studies, analysis, demonstrations, and hardware/software development necessary to provide Intra-Flight Data Link improvements, Electronic Protection, AIM-9X and AIM-120D integration with Common Weapon Engagement Zone, Geolocate 2.0 and Stores Management System Common Split Bus. The Enhanced Stores Management System (ESMS) program is a hardware development program required to integrate any new weapons on the F-22 beyond Increment 3.1. Includes mission support of the F-22 Program Office: travel, computer costs, and other miscellaneous contract support. FY 2019 Plans: N/A FY 2020 Plans: | 1.148 | 0.000 | 0.000 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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|--|---|
| Appropriation/Budget Activity 3600: Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD) | R-1 Program Element (Number/Name) PE 0605213F / F-22 Modernization Increment 3.2B |
|--|---|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| N/A | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: N/A | | | |
| Title: Combined Test Force (CTF) | 9.334 | 0.000 | 0.000 |
| Description: The F-22 Combined Test Force (CTF), located at Edwards Air Force Base, conducts testing to assess performance and military utility of Increment 3.2B. The CTF uses operationally relevant ground and flight test scenarios to identify Increment 3.2B performance deficiencies. This funds Inc 3.2B unique test costs. | | | |
| FY 2019 Plans: N/A | | | |
| FY 2020 Plans: N/A | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: N/A | | | |
| Accomplishments/Planned Programs Subtotals | 10.482 | 0.000 | 0.000 |

| D. Other Program Funding Summary (\$ in Millions) | | | | | | | | | | | |
|--|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|
| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> <u>Base</u> | <u>FY 2020</u> <u>OCO</u> | <u>FY 2020</u> <u>Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To</u> <u>Complete</u> | <u>Total Cost</u> |
| • RDTE 07 PE 0207138F: <i>F-22A Squadrons, RDT&E*</i> | 413.149 | 315.587 | 423.296 | - | 423.296 | 485.152 | 476.668 | - | - | Continuing | Continuing |
| • APAF 05 Line Item <i>F2232B: Increment 3.2B**</i> | 105.756 | 13.081 | 20.373 | - | 20.373 | 6.013 | - | - | - | 0.000 | 340.617 |
| • APAF 05 Line Item <i>F02200: F-22A***</i> | 176.630 | 257.891 | 257.310 | - | 257.310 | 347.665 | 457.265 | - | - | Continuing | Continuing |
| • APAF 000999: <i>Initial Spares</i> | 7.732 | - | 0.000 | - | 0.000 | - | - | - | - | 0.000 | 14.973 |
| • RDTE 07 PE 0207163F: <i>AIM-120D, AMRAAM T&E, RDT&E****</i> | - | - | 0.000 | - | 0.000 | 0.000 | - | - | - | 0.000 | 50.450 |

Remarks
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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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|---|--|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0605213F / <i>F-22 Modernization Increment 3.2B</i> |
|---|--|

D. Other Program Funding Summary (\$ in Millions)

| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> <u>Base</u> | <u>FY 2020</u> <u>OCO</u> | <u>FY 2020</u> <u>Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To</u> <u>Complete</u> | <u>Total Cost</u> |
|------------------|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|
|------------------|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|

*F-22A Squadrons, RDT&E/PE 0207138F includes F-22A Squadrons modernization and development. Both PEs 0207138F and 0605213F share lab and Combined OTF Test Force infrastructure support costs across the F-22 enterprise.

**Increment 3.2B, APAF/PE 0207138F, F2232B includes BP11 (Aircraft Modifications) for Increment 3.2B only.

***F-22A Squadrons, APAF/PE 0207138F, F02200 includes BPs 11 (Aircraft Modifications), 13 (Post-Production Support), 16 (Initial Spares), and 19 (Depot Activation) for F-22 Squadrons only.

****AIM-120D, AMRAAM RDT&E/PE 0207163F, funding provides for the AIM-120D development as a part of the F-22 Increment 3.2B effort.

E. Acquisition Strategy

The Raptor Enhancement Development & Integration II (REDI II) contract is an Indefinite Delivery/Indefinite Quantity Ordering (ID/IQ) contract that maximizes flexibility to start, stop, accelerate and decelerate projects as required. The REDI II contract is a follow-on to the initial REDI contract. REDI II provides maximum flexibility to manage various modernization projects. The REDI II contract allows for the issuance of orders for efforts associated with the planning, analysis, design, development, qualification, test and documentation of F-22 weapon system performance enhancements, life-cycle improvements, Operational Flight Program (OFP) upgrades, and associated efforts essential to accomplishing the F-22 mission.

Overall the F-22 program is managed with the F-22 SPO leveraging Department of Defense and Air Force guidance and policies to evaluate impacts to performance, schedule, and cost, working closely with key stakeholders to affirm the baseline schedule supporting the initial Increment 3.2B program Initial Operational Capability (IOC) in FY 2019. The F-22 SPO, prime contractors, supporting program offices, and Air Combat Command (ACC) are key stakeholders in risk management.

The F-22 program is transitioning to organic management of major sustainment functions to include: customer services, field support, and fleet management.

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0605213F / F-22 Modernization Increment 3.2B | Project (Number/Name) 654785 / F-22 INCREMENT 3.2B |
|--|--|--|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Increment 3.2B | Various | Lockheed Martin : Ft. Worth, TX | 0.000 | 1.148 | Nov 2017 | - | | - | | - | | - | Continuing | Continuing | 488.035 |
| Subtotal | | | 0.000 | 1.148 | | - | | - | | - | | - | Continuing | Continuing | N/A |

Remarks
Target Value of Contract includes only active REDI/REDI II delivery orders DO 0070, DO 0071, and DO 0004. Target Value of Contract and Total cost do not match due to prior year costs executed in F-22 Squadrons PE 0207138F and other outside funded PE's as documented in the R-2A.

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Combined Test Force | Various | Various : Various | 0.000 | 9.334 | Oct 2017 | - | | - | | - | | - | Continuing | Continuing | - |
| Laboratory Test Operations | SS/ Various | Lockheed Martin : Fort Worth, TX | 0.000 | - | | - | | - | | - | | - | Continuing | Continuing | - |
| Subtotal | | | 0.000 | 9.334 | | - | | - | | - | | - | Continuing | Continuing | N/A |

Remarks
FY12 and prior year costs for Increment 3.2B are shown under PE 0207138F. FY13 and later are shown under PE 0605213F.

| Project Cost Totals | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|--------------------|----------------|----------------|---------------------|--------------------|----------------------|-------------------------|-------------------|---------------------------------|
| | 0.000 | 10.482 | 0.000 | - | - | - | Continuing | Continuing | N/A |

Remarks


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|---|--|---|
| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0605213F / <i>F-22 Modernization Increment 3.2B</i> | Project (Number/Name) 654785 / <i>F-22 INCREMENT 3.2B</i> |

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

F-22 Increment 3.2B

FY18: Continue to resolve software relates issues, complete Air Combat Simulation accreditation, perform live fire and weapons flight tests for Operational Test

| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
|  | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0605213F / <i>F-22 Modernization Increment 3.2B</i> | Project (Number/Name) 654785 / <i>F-22 INCREMENT 3.2B</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>F-22 Increment 3.2B</i> | | | | |
| FY18: Continue to resolve software relates issues, complete Air Combat Simulation accreditation, perform live fire and weapons flight tests for Operational Test | 1 | 2018 | 3 | 2018 |

Note

~ Increment 3.2B efforts funded prior to FY13 are reflected in the F-22A Squadrons documentation, PE 0207138F.

~ Increment 3.2B HW Development/Risk Reduction/Lab Equipment began FY2006.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force / BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0605221F / KC-46 |
|---|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|--|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | 5,494.015 | 75.598 | 80.170 | 59.561 | 0.000 | 59.561 | 78.948 | 50.113 | 22.762 | 23.119 | 0.000 | 5,884.286 |
| 651120: <i>Pegasus Capability Improvements</i> | 0.000 | 0.000 | 13.503 | 13.868 | 0.000 | 13.868 | 41.500 | 26.500 | 22.762 | 23.119 | 0.000 | 141.252 |
| 655271: <i>KC-46 RDT&E</i> | 5,494.015 | 75.598 | 66.667 | 45.693 | 0.000 | 45.693 | 37.448 | 23.613 | 0.000 | 0.000 | 0.000 | 5,743.034 |

Program MDAP/MAIS Code: 387

A. Mission Description and Budget Item Justification

Replacement of the legacy tanker fleet will take place in several stages. The initial tanker replacement increment of KC-46s will replace roughly a third of the current capability. Future programs will ultimately recapitalize the entire tanker fleet over a period of more than 30 years. The Air Force completed an Analysis of Alternatives (AoA) in Apr 2006 to determine the most appropriate strategy to recapitalize the aging fleet of aerial refueling aircraft. Based on this analysis, the Air Force concluded a strategy of full and open competition to select a commercial derivative replacement tanker aircraft would result in a best value tanker contract. To initiate the first phase of the tanker replacement, the KC-46 program released a final Request for Proposal (RFP) on 24 Feb 2010, and entered source selection on 9 Jul 2010. The KC-46 program held a Milestone B (MS B) Defense Acquisition Board (DAB) on 23 Feb 2011, received approval to enter Engineering and Manufacturing Development (EMD) from the Undersecretary of Defense (Acquisition, Technology and Logistics) (USD(AT&L)) on 24 Feb 2011, and awarded the KC-46 EMD contract to Boeing on 24 Feb 2011 to develop and procure 179 KC-46 aircraft. The program is procuring four RDT&E aircraft for integration and demonstration of capability which will ultimately be operationally fielded. During production, the program plans to procure 175 aircraft throughout 13 lots. The KC-46 program held a MS C DAB on 12 Aug 2016 and received approval to enter Low Rate Initial Production (LRIP). The program awarded LRIP Lots 1 and 2 on 18 Aug 2016, LRIP Lot 3 on 27 Jan 2017, LRIP Lot 4 on 10 Sep 2018, and LRIP Lot 5 award is planned for Jul 2019, totaling 67 aircraft. The Air Force delivered the first KC-46 to McConnell Air Force Base on 25 Jan 2019. KC-46 funding also supports Training Systems, Direct Mission Support, Program Management Administration (PMA) activities, government developmental and operational test support, mission planning capability development, various studies and analyses, engineering changes, and future tanker replacement planning activities.

The KC-46 will provide the capability to fuel joint and coalition receivers via a boom or drogue system on every mission and will also augment the airlift fleet with cargo, passenger, and aeromedical evacuation capabilities. The KC-46 will operate in day/night and adverse weather conditions to enable deployment, employment, sustainment, and redeployment of U.S. joint, allied, and coalition forces. The KC-46 will have communication, navigation, and surveillance equipment for worldwide operations; the capability to perform missions in chemical and biological environments; the ability to operate in up to medium threat environments with self-defense/protection (both active and passive) capabilities; and the necessary battlespace awareness to mitigate survivability threats.

The Aircrew Training System (ATS) and the Maintenance Training System (MTS) are being developed and procured using KC-46 funding. The ATS contract was awarded on 1 May 2013 to FlightSafety Services Corporation. The ATS contract will provide Aircrew Training Devices (ATDs), to include Weapon System Trainers (WSTs), Boom Operator Trainers (BOTs), Fuselage Trainers (FuTs), and Part-Task Trainers (PTTs) at each Main Operating Base (MOB) and the Formal Training Unit (FTU). The ATS contract will also support Distributed Mission Operations (DMO), provide aircrew instruction, develop courseware, provide logistics support, acquire a technical data package to support future competition efforts, and manage training device concurrency with the aircraft.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force / BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0605221F / KC-46 |
|---|---|

The MTS contract was awarded 6 Jul 2016 to The Boeing Company. The MTS acquisition focuses on designing, developing, testing, producing, and fielding an optimized training system for KC-46 maintainers by integrating various forms of training media and Maintenance Training Devices (MTDs) into a "blended" solution. This blended solution includes the appropriate mix of hardware and software, "high-fidelity" Augmented Hardware Training Devices (AHTDs), PTTs, Interactive Multimedia Instruction (IMI), and emerging technologies to meet validated Air Mobility Command (AMC) maintenance training requirements.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver KC-46 weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, and 0605898F.

The FY 2020 funding request was reduced by \$20.161 million to account for the availability of prior year execution balances.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 93.845 | 88.170 | 79.722 | 0.000 | 79.722 |
| Current President's Budget | 75.598 | 80.170 | 59.561 | 0.000 | 59.561 |
| Total Adjustments | -18.247 | -8.000 | -20.161 | 0.000 | -20.161 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | -10.000 | -8.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | -5.700 | 0.000 | | | |
| • SBIR/STTR Transfer | -2.547 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | -20.161 | 0.000 | -20.161 |

Change Summary Explanation

FY 2018 was reduced \$18.247M. \$10.0M by a Congressional mark "delayed test program", \$5.7M by reprogrammings and \$2.247M by Small Business Innovation Research (SBIR).

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| Appropriation/Budget Activity | R-1 Program Element (Number/Name) |
|---|--|
| 3600: <i>Research, Development, Test & Evaluation, Air Force / BA 5: System Development & Demonstration (SDD)</i> | PE 0605221F / KC-46 |

FY 2019 was reduced \$8.0M by a Congressional mark "forward financed".

The FY 2020 funding request was reduced by \$20.161 million to account for the availability of prior year execution balances.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|--|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0605221F / KC-46 | Project (Number/Name) 651120 / Pegasus Capability Improvements |
|--|---|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|--|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| 651120: <i>Pegasus Capability Improvements</i> | 0.000 | 0.000 | 13.503 | 13.868 | 0.000 | 13.868 | 41.500 | 26.500 | 22.762 | 23.119 | 0.000 | 141.252 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

The KC-46 will provide the capability to fuel joint and coalition receivers via a boom or drogue system on every mission and will also augment the airlift fleet with cargo, passenger, and aeromedical evacuation capabilities. The KC-46 will operate in day/night and adverse weather conditions to enable deployment, employment, sustainment, and redeployment of U.S. joint, allied, and coalition forces. The KC-46 will have communication, navigation, and surveillance equipment for worldwide operations; the capability to perform missions in chemical and biological environments; the ability to operate in up to medium threat environments with self-defense/protection (both active and passive) capabilities; and the necessary battlespace awareness to mitigate survivability threats.

The dynamics and mission urgency of the post-production (post-DD-250) environment requires the program to maintain a flexible and responsive posture to support a broad range of mission support needs. The KC-46 will continue to identify, design, develop, integrate, verify, certify, produce, install, field, and sustain a comprehensive range of non-recurring and recurring post-production, air vehicle enhancements and field support needs. These needs may originate from programmed Mobility Air Force (MAF) requirements, Combatant Commander Joint or Urgent Operational Needs (JUON/UON), non-programmed Federal Aviation Administration (FAA) directives, requirements identified and supported by HHQ Enterprise Capability Collaboration Teams (i.e., High Value Airborne Asset [HVAA], Air Superiority 2030, and Multi-Domain Command and Control [MDC2]), or correction of field deficiencies.

The KC-46 will continue to develop, field, and sustain warfighter capabilities to meet evolving threats and mission support requirements through Block or discrete modification or modernization programs depending on mission urgency, available funding, and programmatic and technical risks. Post-production requirements can include, but will not be limited to: avionics and structural systems/ architecture and subsystem updates, general mission equipment updates and procurement, general sustainment support, studies and analyses, simulation and training, and correction of field deficiencies.

BPAC 651120 funding will also support Program Management Administration (PMA) activities, test support, mission planning capability development and various studies and analyses.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver KC-46 weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, and 0605898F.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|---------|---------|--------------|-------------|---------------|
| Title: KC-46A Block 1 Pegasus Advanced Communications Suite (PACS) | - | 13.021 | 13.376 | - | 13.376 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0605221F / KC-46 | Project (Number/Name) 651120 / Pegasus Capability Improvements |

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| <p>Description: The KC-46A Block 1 Pegasus Advanced Communications Suite (PACS) program will satisfy Department of Defense (DoD), National Security Agency (NSA), Department of Transportation (DoT), and USAF mandates by upgrading legacy Tactical Data Link 16, Beyond Line-of-Sight (BLOS) Ultra High Frequency (UHF) Line-of-Sight (LOS) capabilities with next-generation Link 16 terminals and UHF secure, global, BLOS and anti-jam LOS satellite voice communications capabilities for the KC-46 weapon system. PACS enables compatibility and interoperability with current and planned future joint and allied forces while simultaneously increasing the survivability of secure global voice and data communications capabilities between Mobility Air Force (MAF) C2 agencies and MAF aircraft operating worldwide in or near contested environments.</p> <p>FY 2019 Plans: Conduct Acquisition Strategy Plan (ASP) and release Request For Proposal (RFP) for KC-46A Block 1 PACS EMD program. Move funding to KC-46 baseline program to support boom telescope stiffness Engineering Change Proposal (ECP) and process a Below Threshold Reprogramming (BTR) of \$3.764M to Open Skies Digital Visual Imaging System (DVIS).</p> <p>FY 2020 Base Plans: Move funding to KC-46 baseline program to support boom telescope stiffness Engineering Change Proposal (ECP).</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding originally increased due to planned contract award of Block 1 PACS EMD program. Now funding will move to KC-46 baseline program to support boom telescope stiffness Engineering Change Proposal (ECP). Block 1 PACS contract award will be deferred to FY21.</p> | | | | | |
| <p>Title: Support</p> <p>Description: Studies and analysis to support planning activities for future initiatives for upgrades, future tanker replacement planning, and miscellaneous Program Office support and planning. Also includes requirements such as travel and training.</p> <p>FY 2019 Plans: Program Office Support and planning.</p> <p>FY 2020 Base Plans: Continue Program Office Support and planning.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p> | - | 0.482 | 0.492 | - | 0.492 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0605221F / KC-46 | Project (Number/Name) 651120 / Pegasus Capability Improvements |

| | | | | | |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
| Funding increased for future initiatives, planning activities, and program office support. | | | | | |
| Accomplishments/Planned Programs Subtotals | - | 13.503 | 13.868 | - | 13.868 |

C. Other Program Funding Summary (\$ in Millions)

| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020 Base</u> | <u>FY 2020 OCO</u> | <u>FY 2020 Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To Complete</u> | <u>Total Cost</u> |
|--|----------------|----------------|---------------------|--------------------|----------------------|----------------|----------------|----------------|----------------|-------------------------|-------------------|
| • APAF 05 41221F/ KC046A: KC-46A Tanker | 1.213 | 8.547 | 10.213 | - | 10.213 | 27.394 | 58.641 | 88.549 | - | Continuing | Continuing |

Remarks

D. Acquisition Strategy

The KC-46 Post-Production Change Management (PPCM) construct is comprised of processes and tools, specifically tailored to a broad spectrum of post-production requirements to support the KC-46 enterprise (e.g. weapon system, sustainability, training devices). PPCM is designed to leverage competition when applicable and emphasize configuration management and discrete cost accounting methodologies. KC-46 PPCM oversight will promote competition throughout the life cycle of the KC-46A fleet. All KC-46 post-production requirements and associated acquisition strategies will be carefully managed, reviewed, and approved at the appropriate levels by the KC-46 Division and/or Tanker Directorate senior functional leaders. PPCM requirements will employ multiple contract-types, tailored to the requirement and documented in discrete Acquisition Strategy Panel briefings, to minimize cost, technical, and schedule execution risks and ensure on-time deliverables. In addition, all ACAT-level programs, deriving from the PPCM process, will follow Department of Defense (DoD) Directive 5000.01 and DoD Instruction 5000.02 guidelines and directives, as applicable, to ensure management controls--commensurate with the scope and cost of the supported requirement.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0605221F / KC-46 | Project (Number/Name) 651120 / Pegasus Capability Improvements |
|--|---|--|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|----------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| KC-46A Capability Upgrades (to include modification and modernization) | C/CPFF | The Boeing Company : Seattle, WA | 0.000 | - | | 13.021 | | 13.376 | Nov 2020 | - | | 13.376 | Continuing | Continuing | - |
| Subtotal | | | 0.000 | - | | 13.021 | | 13.376 | | - | | 13.376 | Continuing | Continuing | N/A |

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| KC-46A Studies and analysis to support future initiatives for upgrades | Various | Not specified. : TBD | 0.000 | - | | 0.482 | Jan 2020 | 0.392 | Jan 2021 | - | | 0.392 | Continuing | Continuing | - |
| Subtotal | | | 0.000 | - | | 0.482 | | 0.392 | | - | | 0.392 | Continuing | Continuing | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|--|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Program Management Administration Activities | Various | KC-46 Program Office : Dayton, W-P AFB, OH | 0.000 | - | | - | | 0.100 | Jan 2021 | - | | 0.100 | 0.000 | 0.100 | - |
| Subtotal | | | 0.000 | - | | - | | 0.100 | | - | | 0.100 | 0.000 | 0.100 | N/A |

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract | |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|-----|
| Project Cost Totals | | 0.000 | - | 13.503 | 13.868 | - | 13.868 | Continuing | Continuing | N/A |

Remarks

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|---|--|---|----------------------------|---|--|
| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 5 | | R-1 Program Element (Number/Name) PE 0605221F / KC-46 | | Project (Number/Name) 651120 / <i>Pegasus Capability Improvements</i> | |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|--|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| <i>Pegasus Capability Improvements</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| KC-46A Block I PACS | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0605221F / KC-46 | Project (Number/Name) 651120 / <i>Pegasus Capability Improvements</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Pegasus Capability Improvements</i> | | | | |
| KC-46A Block I PACS | 1 | 2021 | 4 | 2024 |

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|---|--------------------|----------------|----------------|---------------------|---|----------------------|----------------|----------------|--|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 5 | | | | | R-1 Program Element (Number/Name) PE 0605221F / KC-46 | | | | Project (Number/Name) 655271 / KC-46 RDT&E | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 655271: KC-46 RDT&E | 5,494.015 | 75.598 | 66.667 | 45.693 | 0.000 | 45.693 | 37.448 | 23.613 | 0.000 | 0.000 | 0.000 | 5,743.034 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

Replacement of the legacy tanker fleet will take place in several stages. The initial tanker replacement increment of KC-46s will replace roughly a third of the current capability. Future programs will ultimately recapitalize the entire tanker fleet over a period of more than 30 years. The Air Force completed an Analysis of Alternatives (AoA) in Apr 2006 to determine the most appropriate strategy to recapitalize the aging fleet of aerial refueling aircraft. Based on this analysis, the Air Force concluded a strategy of full and open competition to select a commercial derivative replacement tanker aircraft would result in a best value tanker contract. To initiate the first phase of the tanker replacement, the KC-46 program released a final Request for Proposal (RFP) on 24 Feb 2010, and entered source selection on 9 Jul 2010. The KC-46 program held a Milestone B (MS B) Defense Acquisition Board (DAB) on 23 Feb 2011, received approval to enter Engineering and Manufacturing Development (EMD) from the Undersecretary of Defense (Acquisition, Technology and Logistics) (USD(AT&L)) on 24 Feb 2011, and awarded the KC-46 EMD contract to Boeing on 24 Feb 2011 to develop and procure 179 KC-46 aircraft. The program is procuring four RDT&E aircraft for integration and demonstration of capability which will ultimately be operationally fielded. During production, the program plans to procure 175 aircraft throughout 13 lots. The KC-46 program held a MS C DAB on 12 Aug 2016 and received approval to enter Low Rate Initial Production (LRIP). The program awarded LRIP Lots 1 and 2 on 18 Aug 2016, LRIP Lot 3 on 27 Jan 2017, LRIP Lot 4 on 10 Sep 2018, and LRIP Lot 5 award is planned for Jul 2019, totaling 67 aircraft. The Air Force delivered the first KC-46 to McConnell Air Force Base on 25 Jan 2019. KC-46 funding also supports Training Systems, Direct Mission Support, Program Management Administration (PMA) activities, government developmental and operational test support, mission planning capability development, various studies and analyses, engineering changes, and future tanker replacement planning activities.

The KC-46 will provide the capability to fuel joint and coalition receivers via a boom or drogue system on every mission and will also augment the airlift fleet with cargo, passenger, and aeromedical evacuation capabilities. The KC-46 will operate in day/night and adverse weather conditions to enable deployment, employment, sustainment, and redeployment of U.S. joint, allied, and coalition forces. The KC-46 will have communication, navigation, and surveillance equipment for worldwide operations; the capability to perform missions in chemical and biological environments; the ability to operate in up to medium threat environments with self-defense/protection (both active and passive) capabilities; and the necessary battlespace awareness to mitigate survivability threats.

The Aircrew Training System (ATS) and the Maintenance Training System (MTS) are being developed and procured using KC-46 funding. The ATS contract was awarded on 1 May 2013 to FlightSafety Services Corporation. The ATS contract will provide Aircrew Training Devices (ATDs), to include Weapon System Trainers (WSTs), Boom Operator Trainers (BOTs), Fuselage Trainers (FuTs), and Part-Task Trainers (PTTs) at each Main Operating Base (MOB) and the Formal Training Unit (FTU). The ATS contract will also support Distributed Mission Operations (DMO), provide aircrew instruction, develop courseware, provide logistics support, acquire a technical data package to support future competition efforts, and manage training device concurrency with the aircraft.

The MTS contract was awarded 6 Jul 2016 to The Boeing Company. The MTS acquisition focuses on designing, developing, testing, producing, and fielding an optimized training system for KC-46 maintainers by integrating various forms of training media and Maintenance Training Devices (MTDs) into a "blended" solution. This blended solution includes the appropriate mix of hardware and software, "high-fidelity" Augmented Hardware Training Devices (AHTDs), PTTs, Interactive Multimedia Instruction (IMI), and emerging technologies to meet validated Air Mobility Command (AMC) maintenance training requirements.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|--|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0605221F / KC-46 | Project (Number/Name) 655271 / KC-46 RDT&E |
|--|---|--|

This program element may include necessary civilian pay expenses required to manage, execute, and deliver KC-46 weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, and 0605898F.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|--|---------|---------|--------------|-------------|---------------|
| <p>Title: KC-46 Aircraft Product Development</p> <p>Description: EMD activities will be conducted to include the following types of activities: develop a commercial 767-2C aircraft upon which the KC-46 is based; develop the KC-46 military capability and integrate it into the aircraft; build four EMD aircraft; procure live fire assets; procure required Government Furnished Equipment (GFE); procure simulator and maintenance data; develop technical manuals and Type 1 training; and conduct development and operational testing.</p> <p>FY 2019 Plans: Continue product refinement, studies, ground, and flight testing in support of the KC-46 weapon system to include receiver certifications, Wing Aerial Refueling Pod qualification/certification, simulator data collection, and entrance into Initial Operational Test and Evaluation (IOT&E). Conduct Acquisition Strategy Panel (ASP), release Request For Proposal (RFP), and contract award to execute Engineering Change Proposal to address KC-46 boom telescope stiffness Category 1 Deficiency Report (DR). Remote Vision System (RVS) Other Government Costs (OGCs) for Boeing developed solution for Category 1 DR.</p> <p>FY 2020 Base Plans: Continue product refinement, studies, ground, and flight testing in support of the KC-46 weapon system to include receiver certifications, simulator data collection, and completion of IOT&E events/reporting. Continue execution of boom telescope stiffness Engineering Change Proposal (ECP) and support other government costs associated with solution for Remote Vision System (RVS).</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding decreased due to development activities ramping down.</p> | 26.012 | 15.600 | 14.838 | - | 14.838 |
| <p>Title: KC-46 Trainer Product Development - Aircrew Training System (ATS)</p> <p>Description: Trainer development activities will be conducted to include the following types of activities: development and procurement of ATDs, courseware, and associated support equipment.</p> <p>FY 2019 Plans:</p> | 0.038 | 0.000 | 0.000 | 0.000 | 0.000 |

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|--|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0605221F / KC-46 | Project (Number/Name) 655271 / KC-46 RDT&E |
|--|---|--|

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|---------|---------|--------------|-------------|---------------|
| <p>No FY19 funding is required for the Aircrew Training System effort.</p> <p>FY 2020 Base Plans: No FY19 and FY20 funding required for the Aircrew Training System effort.</p> <p>FY 2020 OCO Plans: N/A</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: N/A</p> | | | | | |
| <p>Title: KC-46 Support</p> <p>Description: Development, integration, and demonstration of the KC-46 mission planning capability. In addition, studies and analysis to support planning activities for future efficiency initiatives, business case analyses, future tanker replacement planning, and miscellaneous Program Office support and planning. Also includes requirements such as travel, office supplies, training courses, and service contracts.</p> <p>FY 2019 Plans: Continue Program Office Support and Planning.</p> <p>FY 2020 Base Plans: Continue Program Office Support and Planning.</p> <p>FY 2020 OCO Plans: N/A</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding decreased due to Program Office Support transition to Production.</p> | 31.748 | 5.608 | 2.078 | 0.000 | 2.078 |
| <p>Title: KC-46 Test & Evaluation</p> <p>Description: Test & Evaluation (T&E) activities will be conducted to include the following types of activities: Development Test & Evaluation, Operational Test & Evaluation, Tanker Qualification, Receiver Certifications, Live Fire Test & Evaluation (LFT&E), Federal Aviation Administration (FAA) support, and other test planning and organizational support.</p> <p>FY 2019 Plans: Continue T&E activities using EMD, pre-delivery production, and/or LRIP aircraft to support airworthiness certification, specification compliance, military utility evaluations, correction of deficiencies, and other T&E</p> | 17.800 | 45.459 | 28.777 | 0.000 | 28.777 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0605221F / KC-46 | Project (Number/Name) 655271 / KC-46 RDT&E |

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| activities for the KC-46. Complete preparations for IOT&E. Continue aerial refueling tanker receiver certification testing, Aerial Refueling Simulator Qualifications data collection and begin IOT&E. | | | | | |
| FY 2020 Base Plans: Continue using EMD, pre-delivery production, and/or LRIP aircraft to support AR tanker-receiver certification testing, Aerial Refueling Simulator Qualifications data collection, correction of deficiencies, and other T&E activities for the KC-46. Complete IOT&E events/reporting in support of the Full Rate Production decision. | | | | | |
| FY 2020 OCO Plans: N/A | | | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: Funding decreased due to completion of T&E activities related to IOT&E. | | | | | |
| Accomplishments/Planned Programs Subtotals | 75.598 | 66.667 | 45.693 | 0.000 | 45.693 |

| C. Other Program Funding Summary (\$ in Millions) | | | | | | | | | | | |
|--|----------------|----------------|---------------------|--------------------|----------------------|----------------|----------------|----------------|----------------|-------------------------|-------------------|
| Line Item | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| • APAF 02 Line Item KC046A: KC-46A Tanker | 2,927.129 | 2,290.932 | 2,234.529 | - | 2,234.529 | 2,870.018 | 2,329.526 | 2,347.895 | 2,900.657 | Continuing | Continuing |
| • APAF 06 Line Item 000999: Initial Spares | 391.323 | 232.028 | 0.000 | - | 0.000 | 175.221 | 161.861 | 204.900 | 239.471 | Continuing | Continuing |

Remarks

D. Acquisition Strategy

The KC-46 Program acquisition strategy is to procure an existing commercial, FAA certified aircraft modified to meet USAF requirements. The KC-46 program released a final RFP on 24 Feb 2010, and entered source selection on 9 Jul 2010. The KC-46 program held a MS B DAB on 23 Feb 2011, received approval to enter EMD from the USD(AT&L) on 24 Feb 2011, and awarded the KC-46 contract to Boeing on 24 Feb 2011 to develop and procure 179 KC-46 aircraft. The KC-46 contract procurement was conducted via a full and open competition per Federal Acquisition Regulation (FAR) Part 15, and resulted in a FY 2011 EMD Fixed Price Incentive Firm (FPIF) contract. The EMD phase will develop, build, and test four KC-46 aircraft, and will qualify the KC-46 as a tanker and certify pairings with receiver aircraft.

The MS B acquisition strategy planned for two LRIP lots followed by 11 Full Rate Production (FRP) lots for a total aircraft procurement of 175 production aircraft. Updates to the acquisition strategy occurred in support of Milestone C (MS C) that increased LRIP from two to five lots and the remaining eight to be FRP lots with the total aircraft buy remaining at 175 Production aircraft (+4 EMD aircraft for a grand total of 179 aircraft).

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0605221F / KC-46 | Project (Number/Name) 655271 / KC-46 RDT&E |
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LRIP began with two Firm Fixed Price (FFP) and two FFP Not to Exceed (NTE) options (LRIP-1 Qty 7, LRIP-2 Qty 12, LRIP-3 Qty 15, and LRIP-4 Qty 18). Lot 5 was approved for LRIP status and is planned for award in Jul 2019 [via a FFP NTE option] followed by eight (Lots 6-13) FFP FRP options [via NTE values + Economic Price Adjustment (EPA)]. LRIP Lots 1 and 2 were awarded on 18 Aug 2016, LRIP Lot 3 was awarded on 27 Jan 2017 and LRIP Lot 4 was awarded on 10 Sep 2018. The FRP options will be exercised following successful completion of IOT&E.

The ATS acquisition strategy is to provide ATDs, and associated support structure, to each MOB and the FTU. The ATS EMD FPIF contract with production options was conducted via a full and open competition per FAR Part 15, and awarded to FlightSafety Services Corporation in FY 2013. The ATS EMD phase will develop and procure ATDs; and will be supported with courseware, Training System Support Center, the technical data package, and support equipment to ensure system availability and concurrency with the aircraft. The first three ATS production options were exercised on 19 Aug 2015, 31 May 2017, and 30 Apr 2018.

The MTS acquisition strategy is to acquire MTDs, and associated support structure, for two AMC active duty Regional Maintenance Training Facilities. The MTS EMD FFP contract with production options was conducted via a full and open competition per FAR Part 15, and awarded to The Boeing Company in FY 2016. The MTS EMD phase will develop and procure MTDs; and will be supported with courseware, Training System Support Center, the technical data package, and support equipment to ensure system availability and concurrency with the aircraft.

The KC-46 Program is responsible for the development, testing, and production of a drogue-equipped, wing-mounted refueling system to meet Capability Production Document (CPD) thresholds and objectives for simultaneous refueling of two probe-equipped receivers. The system can be installed or removed from the KC-46 as mission needs dictate.

The long-term support concept for the KC-46 is organic two-level maintenance (2LM): organization level (O-level) and depot level (D-level). For the purposes of this program, all maintenance other than O-level shall be referred to as D-level. The product support strategy will initially employ Interim Contractor Support (ICS) before transitioning to a 100% organically-managed maintenance and supply support capability. Performance Based Logistics (PBL) solutions will be evaluated during EMD as viable approaches to facilitate the transition.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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| Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force | | | | | | | | | | | Date: February 2019 | | | | |
| Appropriation/Budget Activity 3600 / 5 | | | | | | R-1 Program Element (Number/Name) PE 0605221F / KC-46 | | | | | Project (Number/Name) 655271 / KC-46 RDT&E | | | | |

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|-----------------------------------|--|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| KC-46A aircraft non-recurring development, integration, and testing; 4 RDT&E tanker aircraft; and support | C/FPIF | The Boeing Company : Seattle, WA | 5,005.096 | 26.012 | Apr 2019 | 15.600 | Apr 2019 | 14.838 | Apr 2020 | - | | 14.838 | 51.095 | 5,112.641 | 6,069.817 |
| KC-46A Aircrew Training System | C/FPIF | FlightSafety Services Corp. : Centennial, CO | 86.856 | 0.038 | | 0.000 | | 0.000 | | - | | 0.000 | 0.332 | 87.226 | 87.499 |
| KC-46A Maintenance Training System | C/FFP | The Boeing Company : St. Louis, MO | 45.840 | 0.000 | | 0.000 | | 0.000 | | - | | 0.000 | 0.000 | 45.840 | 45.840 |
| Subtotal | | | 5,137.792 | 26.050 | | 15.600 | | 14.838 | | - | | 14.838 | 51.427 | 5,245.707 | N/A |

Remarks

The KC-46 EMD contract was awarded 24 Feb 2011. The contract ceiling price of \$4.9B is the government's maximum financial liability on the prime contract. The "Total Cost" value represents the MS C Service Cost Position (SCP), which accounts for the ceiling price of the contract plus the financial and schedule risk of potential design changes for the KC-46 aircraft.

FINANCIAL PERFORMANCE: The KC-46 is evaluated against traditional Research and Development (R&D) program expenditure benchmarks. Unlike many traditional R&D programs, the KC-46 EMD contract is a FPIF contract with progress payments. Twenty percent of incurred costs are withheld until the end of the contract, when they are liquidated. Mandatory funding obligations and progress payment withholds will cause the program to lag traditional expenditure benchmarks, painting an inaccurate portrait of overall program health.

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| KC-46A studies and analysis associated with the development, integration, and demonstration of KC-46 capability & future planning | C/CPAF | Various : Various | 76.222 | 22.494 | Mar 2019 | 1.167 | Jul 2019 | 0.100 | Jul 2020 | - | | 0.100 | 0.000 | 99.983 | 99.983 |
| Subtotal | | | 76.222 | 22.494 | | 1.167 | | 0.100 | | - | | 0.100 | 0.000 | 99.983 | N/A |

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0605221F / KC-46 | Project (Number/Name) 655271 / KC-46 RDT&E |
|--|---|--|

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---------------------------------|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |

Remarks
These contracts are on an as needed basis, with various contract types and performing activities.

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| KC-46A testing and planning support of development & operational test, FAA & military certification, and aircraft qualification activities | Various | Various : Various | 167.829 | 17.800 | Dec 2018 | 45.459 | Mar 2019 | 28.777 | Mar 2020 | - | | 28.777 | 8.029 | 267.894 | 267.894 |
| Subtotal | | | 167.829 | 17.800 | | 45.459 | | 28.777 | | - | | 28.777 | 8.029 | 267.894 | N/A |

Remarks
Integrated testing and planning activities are performed by government organizations, with some contractor technical subject matter experts and teaming with the prime contractor.

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| KC-46A Program Management Administration - Program A&AS Support | C/FFP | US Falcon : Dayton, OH | 62.054 | 3.553 | Mar 2019 | 1.433 | Mar 2019 | - | | - | | - | 0.000 | 67.040 | 67.040 |
| KC-46A Program Management Administration - Trainer A&AS Support | C/CPFF | HX5 : Fort Walton Beach, FL | 11.520 | 0.000 | | 0.000 | | 0.000 | | - | | 0.000 | 0.000 | 11.520 | 11.520 |
| KC-46A Program Management Administration - Other | Various | KC-46 Program Office : Dayton, W-P AFB, OH | 38.598 | 5.701 | Oct 2018 | 3.008 | Oct 2019 | 1.978 | Oct 2020 | - | | 1.978 | 1.604 | 50.889 | 50.889 |

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0605221F / KC-46 | Project (Number/Name) 655271 / KC-46 RDT&E |
|--|---|--|

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--------------------------------------|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Subtotal | | | 112.172 | 9.254 | | 4.441 | | 1.978 | | - | | 1.978 | 1.604 | 129.449 | N/A |

Remarks
One Advisory and Assistance (A&AS) contract in FY18 and FY19 over \$1M. Other PMA funding includes, but is not limited to, travel, supplies, and training.

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|
| Project Cost Totals | 5,494.015 | 75.598 | 66.667 | 45.693 | - | 45.693 | 61.060 | 5,743.033 | N/A |

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0605221F / KC-46 | Project (Number/Name) 655271 / KC-46 RDT&E |
|--|---|--|

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
|---|--|
| KC-46 | |
| EMD: KC-46 Aircraft | |
| Takeoff and Landing Data (TOLD) Phase II | |
| Developmental Test & Evaluation to support aircraft delivery | |
| Receiver Certification | |
| Initial Operational Test & Evaluation | |
| Government Testing for Correction of Deficiencies | |
| Boom Telescope Actuator ECP | |
| Mission Planning Support | |
| Depot Maintenance Inter-servicing (DMI), Source of Repair Assignment Process (SORAP), Activation Planning, & FAA Certifications | |
| Aircrew Training System Development & Updates | |
| Maintenance Training System Development & Updates | |

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force **Date:** February 2019

| | | |
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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0605221F / KC-46 | Project (Number/Name) 655271 / KC-46 RDT&E |
|--|---|--|

Schedule Details

| Events by Sub Project | Start | | End | |
|---|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| KC-46 | | | | |
| EMD: KC-46 Aircraft | 1 | 2018 | 3 | 2021 |
| Takeoff and Landing Data (TOLD) Phase II | 4 | 2021 | 4 | 2024 |
| Developmental Test & Evaluation to support aircraft delivery | 1 | 2018 | 2 | 2019 |
| Receiver Certification | 1 | 2018 | 3 | 2020 |
| Initial Operational Test & Evaluation | 3 | 2019 | 4 | 2020 |
| Government Testing for Correction of Deficiencies | 1 | 2019 | 3 | 2021 |
| Boom Telescope Actuator ECP | 3 | 2019 | 3 | 2021 |
| Mission Planning Support | 1 | 2018 | 1 | 2020 |
| Depot Maintenance Inter-servicing (DMI), Source of Repair Assignment Process (SORAP), Activation Planning, & FAA Certifications | 1 | 2018 | 4 | 2019 |
| Aircrew Training System Development & Updates | 1 | 2018 | 4 | 2022 |
| Maintenance Training System Development & Updates | 1 | 2018 | 4 | 2019 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0605223F / <i>Advanced Pilot Training</i> |
|---|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | 17.565 | 82.628 | 245.465 | 348.473 | 0.000 | 348.473 | 263.883 | 197.878 | 119.573 | 34.106 | 3.817 | 1,313.388 |
| 655340: <i>Advanced Trainer Replacement T-X</i> | 17.565 | 82.628 | 245.465 | 348.473 | 0.000 | 348.473 | 263.883 | 197.878 | 119.573 | 34.106 | 3.817 | 1,313.388 |
| Quantity of RDT&E Articles | - | 2 | 3 | - | - | - | - | - | - | - | | |

Program MDAP/MAIS Code: 436

Note

Prior Years Funding \$4.994M was executed in PE 0604233F.

A. Mission Description and Budget Item Justification

The Advanced Pilot Training (APT) program will replace the Air Education Training Command's (AETC) aging T-38C fleet with new aircraft, Ground Based Training System (simulators, training devices, computer based training systems, academics, etc.), Maintenance Training System, and support infrastructure currently used in the fighter/bomber advanced Specialized Undergraduate Pilot Training track as well as in the Introduction to Fighter Fundamentals program. The APT program acquisition strategy was approved by OSD (AT&L) in early FY 2017 (December 2016). At the same time, the APT Team completed their Development Request for Proposal (RFP) Release Defense Acquisition Board and subsequently released the RFP to industry on 30 December 2016. The Program completed source selection evaluations and Milestone B in September 2018 and awarded a Fixed Price Incentive Firm Indefinite Delivery/Indefinite Quantity contract to The Boeing Company on 27 September 2018.

A Preliminary Design Review waiver was approved for the APT program by the Milestone Decision Authority (MDA) and a combined Preliminary Design Review/Critical Design Review is planned for 4th quarter FY 2019. An Independent Technical Risk Assessment (ITRA) policy waiver was also approved for the APT program by the MDA and the Air Force will re-evaluate the need for an ITRA prior to Milestone C decision based on applicable ITRA requirements in effect at that time.

Funding contained in this platform's documentation directly aids AETC flying training enterprise to continue its overall Future Years Defense Program pilot production increase starting in FY 2020, thus reducing the USAF Pilot Shortage.

The FY 2020 funding request was reduced by \$15 million to account for the availability of prior year execution balances.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver the APT weapon system capabilities. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, 0605898F, and 0605833F.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0605223F / <i>Advanced Pilot Training</i> |
|---|--|

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 105.999 | 265.465 | 363.473 | 0.000 | 363.473 |
| Current President's Budget | 82.628 | 245.465 | 348.473 | 0.000 | 348.473 |
| Total Adjustments | -23.371 | -20.000 | -15.000 | 0.000 | -15.000 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | -19.800 | -20.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | -0.700 | 0.000 | | | |
| • SBIR/STTR Transfer | -2.871 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | -15.000 | 0.000 | -15.000 |

Change Summary Explanation

FY18:

Funds were reduced by a Congressional mark, -\$19.8M "Contract Award Delay"

Funds were reprogrammed -\$0.700M, to T-6 (PE 0604233F) for On-Board Oxygen Generation System (OBOGS) Studies

Funds were reduced -\$2.871M, for the SBIR Transfer

FY19:

Funds were reduced by a Congressional mark, -\$20M "Excess to Need"

FY20:

The FY 2020 funding request was reduced by \$15 million to account for the availability of prior year execution balances.

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| Title: Advanced Pilot Training (APT) Program | 82.628 | 245.465 | 348.473 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0605223F / <i>Advanced Pilot Training</i> |
|---|--|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| <p>Description: The Advanced Pilot Training program has an approved acquisition strategy, completed Milestone B, and has progressed into the Engineering and Manufacturing Development (EMD) phase. This effort includes studies, analysis, acquisition documentation, and market research activities to reduce risk and support the acquisition strategy and engineering and manufacturing development. It also includes Program Management Administration (PMA) such as travel, Other Government Costs (OGC), and Advisory and Assistance Services (A&AS).</p> <p>FY 2019 Plans: Program plans to conduct a combined Aircraft Preliminary Design Review (PDR) / Critical Design Review (CDR) and a Ground Based Training System (GBTs) PDR, initiate developmental test and evaluation activities, and complete the first operational assessment. Plans include procuring three EMD test articles. Plans also include PMA such as travel, OGC's, and A&AS.</p> <p>FY 2020 Plans: Program plans to conduct a GBTS CDR and continue developmental test and evaluation of the EMD test articles. The Maintenance Training System Request for Proposal may also be released. Plans also include PMA such as travel, OGC's, and A&AS.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding increase to support Post-Critical Design Review (CDR) development activities and continue test and integration throughout FY 2020 of the EMD test article(s).</p> | | | |
| Accomplishments/Planned Programs Subtotals | 82.628 | 245.465 | 348.473 |

| D. Other Program Funding Summary (\$ in Millions) | | | | | | | | | | | |
|---|----------------|----------------|-------------------------|------------------------|--------------------------|----------------|----------------|----------------|----------------|-----------------------------|-------------------|
| Line Item | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| • APAF 03 APT000: <i>Advanced Trainer Replacement T-X</i> | - | - | - | - | - | - | 299.090 | 279.134 | 384.686 | 6,466.135 | 7,429.045 |
| • APAF 06 APT000: <i>Advanced Trainer Replacement T-X</i> | - | - | - | - | - | - | 29.908 | 28.537 | 37.813 | 546.826 | 643.084 |
| • APAF 07 75: <i>Other Production Charges</i> | - | - | - | - | - | - | - | 21.415 | 70.664 | 0.000 | 92.079 |
| • OPAF 04 845010: <i>BASE PROCURED EQUIPMENT</i> | - | - | - | - | - | 0.300 | 4.600 | 4.200 | 3.400 | 19.000 | 31.500 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|--|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0605223F / <i>Advanced Pilot Training</i> |
|---|--|

D. Other Program Funding Summary (\$ in Millions)

| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> <u>Base</u> | <u>FY 2020</u> <u>OCO</u> | <u>FY 2020</u> <u>Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To</u> <u>Complete</u> | <u>Total Cost</u> |
|---|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|
| • MILCON 0804701F: <i>T-X (Advanced Pilot Trainer) Procurement</i> | - | - | 31.600 | - | 31.600 | 15.500 | 0.000 | 51.200 | 15.619 | 88.900 | 202.819 |

Remarks

E. Acquisition Strategy

This Advanced Pilot Training (APT) Program will develop, test, acquire, and sustain an affordable, agile, and integrated APT System consisting of 351 aircraft, Ground Based Training System, Maintenance Training System, support, infrastructure, and personnel to meet Air Education and Training Command's initial need date of FY 2024.

The APT program's acquisition strategy leveraged market conditions by competing and awarding development, production, and initial sustainment in a single contract award. The program completed source selection evaluations and Milestone B in September 2018 and awarded a Fixed Price Incentive Firm Indefinite Delivery/Indefinite Quantity contract to The Boeing Company on 27 September 2018 to provide for development, integration, and testing needed to meet existing APT requirements. Additional contract options are available for Low Rate Initial Production, Full Rate Production and initial sustainment transition. The Maintenance Training System will be procured under a separate contractual vehicle.

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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| Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force | | | | | | | | | | | | Date: February 2019 | | | | |
|---|------------------------|--------------------------------|-------------|---------------------------------------|------------|---------|------------|---|------------|-------------|------------|---------------------|------------------|------------|--------------------------|--|
| Appropriation/Budget Activity | | | | R-1 Program Element (Number/Name) | | | | Project (Number/Name) | | | | | | | | |
| 3600 / 5 | | | | PE 0605223F / Advanced Pilot Training | | | | 655340 / Advanced Trainer Replacement T-X | | | | | | | | |
| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | | | | |
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | Target Value of Contract | |
| Advanced Pilot Training Contracts | Various | Various : TBD | 0.000 | 75.939 | Sep 2018 | 223.539 | Nov 2018 | 317.600 | Nov 2019 | - | | 317.600 | 500.016 | 1,117.094 | 1,117.094 | |
| Subtotal | | | 0.000 | 75.939 | | 223.539 | | 317.600 | | - | | 317.600 | 500.016 | 1,117.094 | N/A | |
| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | | | | |
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | Target Value of Contract | |
| Advanced Pilot Training Studies and Analysis | Various | Various : Various | 2.799 | 0.060 | | 3.313 | Jan 2019 | 3.547 | Mar 2020 | - | | 3.547 | 13.889 | 23.608 | - | |
| Subtotal | | | 2.799 | 0.060 | | 3.313 | | 3.547 | | - | | 3.547 | 13.889 | 23.608 | N/A | |
| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | | | | |
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | Target Value of Contract | |
| Advanced Pilot Training Test Support | Various | Edwards AFB : Edwards AFB, CA | 0.442 | 0.855 | Jul 2018 | 7.100 | Jan 2019 | 15.000 | Nov 2019 | - | | 15.000 | 65.300 | 88.697 | - | |
| Subtotal | | | 0.442 | 0.855 | | 7.100 | | 15.000 | | - | | 15.000 | 65.300 | 88.697 | N/A | |
| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | | | | |
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | Target Value of Contract | |
| Advanced Pilot Training PMA Other Government Costs | Various | AFLCMC : Dayton, OH | 2.482 | 2.380 | Oct 2017 | 3.333 | Oct 2018 | 3.567 | Oct 2019 | - | | 3.567 | 13.970 | 25.732 | - | |
| Advanced Pilot Training A&AS | Various | AFLCMC : Dayton, OH | 11.842 | 3.394 | Mar 2018 | 8.180 | Mar 2019 | 8.759 | Mar 2020 | - | | 8.759 | 34.297 | 66.472 | - | |
| Subtotal | | | 14.324 | 5.774 | | 11.513 | | 12.326 | | - | | 12.326 | 48.267 | 92.204 | N/A | |

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|--|--------------------|----------------|--|--|--|---------------------|--|----------------------|-------------------------|-------------------|---------------------------------|
| Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force | | | | | | | Date: February 2019 | | | | |
| Appropriation/Budget Activity 3600 / 5 | | | | R-1 Program Element (Number/Name) PE 0605223F / <i>Advanced Pilot Training</i> | | | Project (Number/Name) 655340 / <i>Advanced Trainer Replacement T-X</i> | | | | |
| | Prior Years | FY 2018 | | FY 2019 | | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
| Project Cost Totals | 17.565 | 82.628 | | 245.465 | | 348.473 | - | 348.473 | 627.472 | 1,321.603 | N/A |

Remarks

Prior years amounts under Program 0604233F, Specialized Undergraduate Flight Training.
 Advanced Pilot Training Studies and Analysis: \$0.935M
 Advanced Pilot Training PMA Government Costs: \$1.383M
 Advanced Pilot Training A&AS: \$2.676M

FINANCIAL PERFORMANCE: APT is evaluated against traditional Research and Development (R&D) program expenditure benchmarks. Unlike many traditional R&D programs, however, the APT EMD contract is a FPIF contract with progress payments. Twenty percent of incurred costs are withheld until the end of the contract, when they are liquidated. Mandatory funding obligations and progress payment withholds will cause the program to lag traditional expenditure benchmarks, painting an inaccurate portrait of overall program health.

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|--|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0605223F / <i>Advanced Pilot Training</i> | Project (Number/Name) 655340 / <i>Advanced Trainer Replacement T-X</i> |
|--|--|--|

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
|--|--|
| <i>Advanced Pilot Training</i> | |
| Source Selection | |
| Milestone B | |
| Engineering and Manufacturing Development (EMD) Phase | |
| Aircraft Preliminary Design Review (PDR) | |
| Aircraft Critical Design Review (CDR) | |
| Ground Based Training Simulator (GBTS) Preliminary Design Review (PDR) | |
| Ground Based Training Simulator (GBTS) Critical Design Review (CDR) | |
| Development, Test and Evaluation | |
| Milestone C | |
| Operational Test Readiness Review (OTRR) | |
| Initial Operational Test & Evaluation (IOT&E) | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0605223F / <i>Advanced Pilot Training</i> | Project (Number/Name) 655340 / <i>Advanced Trainer Replacement T-X</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Advanced Pilot Training</i> | | | | |
| Source Selection | 1 | 2018 | 4 | 2018 |
| Milestone B | 4 | 2018 | 4 | 2018 |
| Engineering and Manufacturing Development (EMD) Phase | 4 | 2018 | 3 | 2022 |
| Aircraft Preliminary Design Review (PDR) | 4 | 2019 | 4 | 2019 |
| Aircraft Critical Design Review (CDR) | 4 | 2019 | 4 | 2019 |
| Ground Based Training Simulator (GBTS) Preliminary Design Review (PDR) | 3 | 2019 | 3 | 2019 |
| Ground Based Training Simulator (GBTS) Critical Design Review (CDR) | 1 | 2020 | 1 | 2020 |
| Development, Test and Evaluation | 3 | 2019 | 2 | 2022 |
| Milestone C | 3 | 2022 | 3 | 2022 |
| Operational Test Readiness Review (OTRR) | 2 | 2023 | 3 | 2023 |
| Initial Operational Test & Evaluation (IOT&E) | 3 | 2023 | 2 | 2024 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0605229F / <i>Combat Rescue Helicopter</i> |
|---|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | 886.202 | 342.030 | 445.652 | 247.047 | 0.000 | 247.047 | 37.711 | 21.488 | 21.879 | 0.000 | 0.000 | 2,002.009 |
| 654364: <i>Combat Rescue Helicopter</i> | 886.202 | 342.030 | 445.652 | 247.047 | 0.000 | 247.047 | 37.711 | 21.488 | 21.879 | 0.000 | 0.000 | 2,002.009 |
| Quantity of RDT&E Articles | 9 | - | - | 1 | - | 1 | - | - | - | - | | |

Program MDAP/MAIS Code: 479

A. Mission Description and Budget Item Justification

The Combat Rescue Helicopter (CRH) program will replace the aging HH-60G. The HH-60G currently supports the Air Force's core function of Personnel Recovery. The primary mission of the HH-60G is to conduct day / night / marginal weather Combat Search and Rescue (CSAR) in order to recover downed aircrew or other isolated personnel in hostile or non-permissive environments.

The CRH will be capable of employment day or night, in adverse weather, and across the full spectrum of threats to include chemical, biological, radiological, and nuclear. Onboard defensive capabilities will permit the CRH system to operate with less risk than legacy systems in an increased threat environment. An in-flight air refueling capability will provide an airborne alert capability and extend its combat mission range. The CRH system is capable of conducting combat search and rescue airborne mission commander duties. The aircraft will be self-supporting to the maximum extent practical. The CRH system may also conduct other collateral missions inherent in their capabilities to conduct Personnel Recovery, such as non-conventional assisted recovery, non-conventional evacuation operations, defense support to civil authorities, civil search and rescue, international aid, emergency aeromedical evacuation, disaster/humanitarian relief, counterdrug activities, support for National Aeronautics and Space Administration flight operations, and insertion/extraction of combat forces.

The CRH development program will procure a total of ten aircraft as follows: four Engineering, Manufacturing, and Development (EMD) aircraft, five System Demonstration Test Article (SDTA) aircraft, and one modernization flight test aircraft. The FY20 PB added the modernization flight test aircraft increasing the program of record from 112 to 113. In addition, the CRH program office will procure necessary ground and flight assets required for both Development Test (DT) and Initial Operational Test & Evaluation (IOT&E). The CRH EMD contract includes development of the complete CRH training system to include CRH Weapon System Trainer (WST), Operational Flight Trainer (OFT), Airframe Systems Trainer (AST), Avionics Desktop Trainer (AVDTT), other maintenance training devices, with associated spares and support equipment, as well as Type 1 training and courseware required to perform aircrew and maintenance training. Other development efforts include a systems integration laboratory, an avionics integration support facility, procurement of data rights and licenses, spares, SDTA aircraft, Government test, and product support. Where possible, the CRH program will pursue modernization efforts using rapid acquisition authorities to develop and integrate enhancements in mission/defensive systems and additional system upgrades to address critical capability gaps. The program office will utilize the additional flight test aircraft in support of planned modernization efforts, including Infrared Countermeasures (IRCM) testing.

The Delta Training Device (DTD) development effort will procure a total of two Engineering & Manufacturing Development (EMD) training assets, a maintenance Crew Chief Part Task Trainer (CCPTT) and an aircrew Hoist Procedural Trainer (HPT) with associated spares and support equipment, as well as Type 1 training.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0605229F / <i>Combat Rescue Helicopter</i> |
|---|---|

This program element may include necessary civilian pay expenses required to manage, execute, and deliver Combat Rescue Helicopter weapon system capability. The use of such program funds will be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, 0605898F and 0605833F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 354.485 | 457.652 | 232.047 | 0.000 | 232.047 |
| Current President's Budget | 342.030 | 445.652 | 247.047 | 0.000 | 247.047 |
| Total Adjustments | -12.455 | -12.000 | 15.000 | 0.000 | 15.000 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | -12.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -12.455 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 15.000 | 0.000 | 15.000 |

Change Summary Explanation

FY 2018: Funds reduced by \$12.455M for a Small Business Innovation Research (SBIR) transfer.

FY 2019: Funds reduced by \$12M for a Congressional mark, "Development funding excess to need"

FY 2020: The FY 2020 funding request was increased by \$15 million. This increase, along with reprioritization of unrealized risk funding, procured an additional HH-60W for modernization flight test, increasing the program of record to 113 aircraft.

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Title: Combat Rescue Helicopter (CRH) | 333.030 | 434.252 | 235.347 | 0.000 | 235.347 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| | |
|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0605229F / <i>Combat Rescue Helicopter</i> |
|---|---|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|---------|---------|--------------|-------------|---------------|
|---|---------|---------|--------------|-------------|---------------|

Description: Develop a new helicopter, associated training system and support elements that leverage fielded, non-developmental technologies to recapitalize the HH-60G fleet.

FY 2019 Plans:
Continue development efforts on CRH aircraft, training systems and associated product support and begin modernization development. Continue to develop the EMD and SDTA aircrafts and conduct required testing. Continue pre-operational support, aircrew training, and maintenance support for support and integration facilities. Stabilize facilities expansion and equipment purchase for Electronic Warfare Integrated Reprogramming (EWIR) capability. Management services including studies and analysis, miscellaneous program office support, travel, office supplies, training courses and service contracts. This program is expected to receive approval to enter Milestone C Production and Deployment phase and initiate the Low Rate Initial Production (LRIP) contract award in Sep 19.

FY 2020 Base Plans:
Continue development efforts on CRH aircraft, training systems, modernization and associated product support, including acquiring an additional test aircraft. Use rapid acquisition authorities to develop and integrate mission/defensive systems to address capability gaps. Continue to develop the EMD and SDTA aircrafts and conduct required testing. Continue pre-operational support, aircrew training, and maintenance support for support and integration facilities. Continue management services including studies and analysis, miscellaneous program office support, travel, office supplies, training courses and service contracts.

FY 2020 OCO Plans:
None

FY 2019 to FY 2020 Increase/Decrease Statement:
Funding decreased due to ramping down of NRE development efforts as initiation of Government Test activities ramp up, and the program transitions into the production phase.

| | | | | | |
|---|-------|--------|--------|-------|--------|
| Title: Combat Rescue Helicopter Government Test and Evaluation | 9.000 | 11.400 | 11.700 | 0.000 | 11.700 |
|---|-------|--------|--------|-------|--------|

Description: Conduct test and evaluation on the Combat Rescue Helicopter and associated training systems to support Developmental Test and Evaluation planning, Operational Test and Evaluation planning, Live Fire Test and Evaluation, and other test planning and organizational support.

FY 2019 Plans:

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0605229F / <i>Combat Rescue Helicopter</i> |
|---|---|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|--|---------|---------|-----------------|----------------|------------------|
| Continue to witness contractor qualification testing on subcomponents. Continue Operational Test and Evaluation Planning. Conduct Developmental Test and Evaluation and Live Fire Test and Evaluation. FY 2020 Base Plans: Continue to witness contractor qualification testing on subcomponents. Use rapid acquisition authorities to test and evaluate mission/defensive systems. Continue Operational Test and Evaluation Planning. Conduct Developmental Test and Evaluation and Live Fire Test and Evaluation. FY 2020 OCO Plans: None FY 2019 to FY 2020 Increase/Decrease Statement: Funding increased due to updated phasing of test and evaluation activities. | | | | | |
| Accomplishments/Planned Programs Subtotals | 342.030 | 445.652 | 247.047 | 0.000 | 247.047 |

| D. Other Program Funding Summary (\$ in Millions) | | | | | | | | | | | |
|---|----------------|----------------|-------------------------|------------------------|--------------------------|----------------|----------------|----------------|----------------|-----------------------------|-------------------|
| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020 Base</u> | <u>FY 2020 OCO</u> | <u>FY 2020 Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To Complete</u> | <u>Total Cost</u> |
| • MILCON Line Item 0207229F: <i>Combat Rescue Helicopter</i> | - | 5.900 | 15.500 | - | 15.500 | 4.050 | 16.318 | - | 4.290 | 0.000 | 46.058 |
| • APAF 04 Line Item H060WH: <i>Combat Rescue Helicopter</i> | - | 660.358 | 884.235 | - | 884.235 | 1,015.772 | 876.340 | 854.839 | 851.542 | 2,010.200 | 7,153.286 |

Remarks

E. Acquisition Strategy
 Procure a new helicopter and associated training systems, and support elements that leverage fielded non-developmental technologies to recapitalize the HH-60G fleet.

Under the CRH development effort, the program office will procure a total of ten aircraft as follows: four Engineering, Manufacturing, and Development (EMD) aircraft, five System Demonstration Test Article (SDTA) aircraft, and one modernization flight test aircraft. In addition, the CRH program office will procure necessary ground and flight assets required for both DT and IOT&E. The FY20 PB added the modernization flight test aircraft increasing the program of record from 112 to 113.

The main CRH contract includes development of the complete CRH system to include delivery of ten aircraft, associated training systems, support elements Weapon System Trainer (WST), Operational Flight Trainer (OFT), Avionics Desktop Trainer (AVDTT), Airframe Systems Trainer (AST), other maintenance Part Task Trainers, with associated spares and support equipment, as well as Type 1 training and courseware required to perform aircrew and maintenance training. An additional prime

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force Date: February 2019

| | |
|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0605229F / <i>Combat Rescue Helicopter</i> |
|---|---|

contract was awarded to develop and acquire additional training devices. Other efforts include, but are not limited to, development of a systems integration laboratory and an avionics integration support facility, as well as procurement of data rights and licenses, spares, SDTA and product support for the EMD effort. The CRH modernization effort will use rapid acquisition authorities where possible to accelerate fielding of capabilities while still in production, minimizing the need for future post-production modifications.

The current contract types for this effort are Fixed Price through Low Rate Initial Production (LRIP). As originally planned following source selection, a formal HH-60W Training System Requirements Analysis (TSRA) was completed in Sep 2015. This analysis identified additional training requirements not accounted for in the original contract. These additional training devices, associated spares, support equipment, Type 1 Training and initial contractor support was competitively awarded in Aug 18.

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|--|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0605229F / <i>Combat Rescue Helicopter</i> | Project (Number/Name) 654364 / <i>Combat Rescue Helicopter</i> |
|--|---|--|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|---|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| CRH aircraft development, integration, test articles, trainers, support and contractor test | C/FPIF | Sikorsky Aircraft Corporation : Stratford, CT | 839.029 | 313.104 | Dec 2017 | 357.001 | Dec 2018 | 120.649 | Dec 2019 | - | | 120.649 | 8.150 | 1,637.933 | - |
| Acquisition of additional CRH training devices | C/FFP | Logistics Services Int'l : TBD | 0.000 | 9.000 | Aug 2018 | 12.000 | Aug 2018 | 5.557 | Aug 2019 | - | | 5.557 | 0.000 | 26.557 | - |
| CRH Modernization | C/TBD | TBD : TBD | 0.000 | - | | 21.682 | Aug 2019 | 85.024 | Dec 2019 | - | | 85.024 | 103.263 | 209.969 | - |
| Subtotal | | | 839.029 | 322.104 | | 390.683 | | 211.230 | | - | | 211.230 | 111.413 | 1,874.459 | N/A |

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| CRH product support related to aircraft development, integration, test articles, trainers, contractor test.and | Various | Various : TBD | 12.260 | 4.387 | Jun 2018 | 35.701 | Jun 2019 | 14.992 | Jun 2020 | - | | 14.992 | 0.368 | 67.708 | - |
| Subtotal | | | 12.260 | 4.387 | | 35.701 | | 14.992 | | - | | 14.992 | 0.368 | 67.708 | N/A |

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|-------------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| CRH planning and testing to support developmental and operational test, live fire test and other weapon system testing and support | PO | 413th Test Squadron : Eglin AFB, FL | 10.403 | 9.000 | Dec 2017 | 11.400 | Dec 2018 | 11.700 | Dec 2019 | - | | 11.700 | 1.000 | 43.503 | - |
| Subtotal | | | 10.403 | 9.000 | | 11.400 | | 11.700 | | - | | 11.700 | 1.000 | 43.503 | N/A |

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|--|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0605229F / <i>Combat Rescue Helicopter</i> | Project (Number/Name) 654364 / <i>Combat Rescue Helicopter</i> |
|--|---|--|

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| CRH A&AS Support | C/CPFF | EPASS : Dayton, OH | 18.131 | 5.278 | Mar 2018 | 5.558 | Mar 2019 | 5.725 | Mar 2020 | - | | 5.725 | 0.000 | 34.692 | - |
| CRH Other PMA | Various | Various : Various | 6.379 | 1.261 | Dec 2017 | 2.310 | Dec 2018 | 3.400 | Dec 2019 | - | | 3.400 | 0.200 | 13.550 | - |
| Subtotal | | | 24.510 | 6.539 | | 7.868 | | 9.125 | | - | | 9.125 | 0.200 | 48.242 | N/A |
| Project Cost Totals | | | 886.202 | 342.030 | | 445.652 | | 247.047 | | - | | 247.047 | 112.981 | 2,033.912 | N/A |

Remarks
 FINANCIAL PERFORMANCE: CRH is evaluated against traditional Research and Development (R&D) program expenditure benchmarks. Unlike many traditional R&D programs, however, the CRH EMD contract is a FPIF contract with progress payments. Twenty percent of incurred costs are withheld until the end of the contract, when they are liquidated. Mandatory funding obligations, progress payment restrictions and DFAS withholds will cause the program to lag traditional expenditure benchmarks, painting an inaccurate portrait of overall program health.

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0605229F / <i>Combat Rescue Helicopter</i> | Project (Number/Name) 654364 / <i>Combat Rescue Helicopter</i> |
|--|---|--|

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|--|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| <i>Combat Rescue Helicopter EMD Schedule</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CRH EMD Development | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CRH Training System EMD Development | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CRH Test and Evaluation | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Developmental Test and Evaluation | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Milestone C | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Required Assets Available for Initial Operational Capability | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0605229F / <i>Combat Rescue Helicopter</i> | Project (Number/Name) 654364 / <i>Combat Rescue Helicopter</i> |
|--|---|--|

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Combat Rescue Helicopter EMD Schedule</i> | | | | |
| CRH EMD Development | 1 | 2018 | 4 | 2023 |
| CRH Training System EMD Development | 1 | 2018 | 1 | 2021 |
| CRH Test and Evaluation | 1 | 2018 | 4 | 2021 |
| Developmental Test and Evaluation | 4 | 2018 | 1 | 2021 |
| Milestone C | 4 | 2019 | 4 | 2019 |
| Required Assets Available for Initial Operational Capability | 4 | 2020 | 4 | 2020 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force / BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0605458F / <i>Air & Space Ops Center 10.2 RDT&E</i> |
|---|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|-------------------------------------|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | 162.711 | 4.666 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 167.377 |
| 654945: <i>AOC 10.2 Development</i> | 162.711 | 4.666 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 167.377 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | - | |

Program MDAP/MAIS Code: N42

Note

In FY 2019, PE 0605458F, Air & Space Ops Center 10.2 RDT&E, Project 654945, AOC 10.2 Development (AOC WS Inc 10.2), terminated 16 Jan 18.

A. Mission Description and Budget Item Justification

The Air Operations Center Weapon System (AOC WS), AN/USQ-163 Falconer, the senior element of the Theater Air Control System (TACS), is the weapon system the Commander, Air Force Forces (COMAFFOR) provides the Combined/Joint Force Air Component Commander (C/JFACC) for planning, executing, and assessing theater-wide air and space operations. The C/JFACC provides air, space and cyber support to the Combined/Joint Forces Commander (C/JFC) by coordinating, deconflicting and assessing the progress of various weapon systems to advance the C/JFC's campaign. The AOC WS develops operations strategy and planning documents. The weapon system also disseminates tasking orders; executes day-to-day peacetime and combat air, space and cyber operations; and provides rapid reaction to immediate situations by exercising positive control of friendly forces.

The AOC WS Increment 10.2 set of requirements keeps the AOC interoperable, certified, supportable, and compliant through the integration, testing and fielding of new capabilities and upgrades to the AOC WS baseline. The program supports mission requirements at Geographic and Global (formerly known as Functional) AOCs, as well as Support and Manpower Augmentation units. To keep the AOC current and interoperable with the Combatant Commands (CCMD), cyber requirements, and fifth generation weapon system/weapons, the AOC WS program plans to evolve the AOC through the integration and test of progressively improving capabilities by incremental and rapid delivery of requirements using commercial software development best practices. These activities ensure a system of systems engineering perspective for the AOC WS, and include weapon system standardization activities as defined by AOC WS requirements documents. AOC WS Increment 10.2 received a Milestone B decision 11 October 2013. This project intended to provide for design, development, integration of 3rd Party capabilities, and testing; as well as, build-up and fielding of the Help Desk (HD), Formal Training Unit (FTU), Combined Air Operations Center-experimental (CAOC-X) suite, and one geographic site. The use of lengthy legacy acquisition methodologies resulting in multi-year period before delivery drove the AF to change acquisition approaches and terminate the Prime Contract in July 2017 in order to pursue evolutionary industry best-practiced approaches.

In FY 2020, no funding is requested and no funding is required due to AOC WS Increment 10.2 contract termination in July 2017 and Program of Record cancellation in January 2018.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0605458F / <i>Air & Space Ops Center 10.2 RDT&E</i> |
|---|--|

This program element may include necessary civilian pay expenses required to manage, execute, and deliver AOC WS Increment 10.2 capabilities. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, and 0605898F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 119.745 | 0.000 | 0.000 | 0.000 | 0.000 |
| Current President's Budget | 4.666 | 0.000 | 0.000 | 0.000 | 0.000 |
| Total Adjustments | -115.079 | 0.000 | 0.000 | 0.000 | 0.000 |
| • Congressional General Reductions | -0.334 | 0.000 | | | |
| • Congressional Directed Reductions | -114.745 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Change Summary Explanation

FY 2018: Decrease of \$114.745M due to cancellation of AOC 10.2 program and Air Force request to transfer funding to PE 0207410F, AOC, Project 674596, AOC WS Modifications, for the purpose of software production and sustainment activities for rapid incremental improvements to the AOC WS.

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| Title: AOC WS Inc 10.2 Development | 4.666 | 0.000 | 0.000 | 0.000 | 0.000 |
| Description: AOC 10.2 infrastructure development and mission capability integration. Development of a robust, open, Net-Centric infrastructure with a Service Oriented Architecture (SOA). Conduct system maintenance and interoperability updates. | | | | | |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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|---|--|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0605458F / <i>Air & Space Ops Center 10.2 RDT&E</i> |
|---|--|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|--|----------------|----------------|-------------------------|------------------------|--------------------------|
| <i>FY 2019 Plans:</i> N/A | | | | | |
| <i>FY 2020 Base Plans:</i> N/A | | | | | |
| <i>FY 2020 OCO Plans:</i> N/A | | | | | |
| <i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> N/A | | | | | |
| Accomplishments/Planned Programs Subtotals | 4.666 | 0.000 | 0.000 | 0.000 | 0.000 |

D. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

E. Acquisition Strategy

The acquisition strategy builds on existing capabilities using evolutionary acquisition to standardize, modernize and sustain the AOC. With the termination of the AOC 10.2 Prime Contract on 13 Jul 17 and official cancellation on 16 Jan 18, the Air Force is undergoing the orderly shutdown to cancel the AOC 10.2 Program of Record. Additionally, Raytheon was awarded the Long-Term Modification and Sustainment (LTM&S) contract for the AOC WS on 24 Apr 17, with official hand-off as of 30 Jun 17. This means the Air Force will leverage Raytheon for sustainment of the existent AOC 10.1 baseline as well as modifications to that baseline in pursuit of a modernized AOC. The Air Force pursued the AOC Pathfinder effort designed to mirror commercial software best practices to incrementally deliver capability to the warfighter at a rapid and efficient pace using Agile DevOps. Partnered with Defense Digital Service (DDS) and Defense Innovation Unit Experimental (DIUx), and using the AOC 10.1 baseline as the starting point, the Air Force will leverage AOC 10.2 components piecemeal as applicable to agile software develop the existing backlog.

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|---|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0605458F / Air & Space Ops Center 10.2 RDT&E | Project (Number/Name) 654945 / AOC 10.2 Development |
|--|--|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| AOC WS Inc 10.2 Modernization Government Furnished Equipment | Various | Various : Various | 2.027 | 0.000 | | - | | - | | - | | - | 0.000 | 2.027 | - |
| AOC WS Inc 10.2 Modernization Contract | C/CPIF | Northrop Grumman : Herndon, VA | 129.762 | 3.780 | Mar 2019 | - | | - | | - | | - | 0.000 | 133.542 | 212.958 |
| AOC WS Inc 10.2 Training | C/Various | Various : Various | 2.936 | 0.000 | | - | | - | | - | | - | 0.000 | 2.936 | - |
| Subtotal | | | 134.725 | 3.780 | | - | | - | | - | | - | 0.000 | 138.505 | N/A |

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| AOC WS Inc 10.2 Test | Various | Various : Various | 4.885 | 0.000 | | - | | - | | - | | - | 0.000 | 4.885 | - |
| Subtotal | | | 4.885 | 0.000 | | - | | - | | - | | - | 0.000 | 4.885 | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| AOC WS Inc 10,2 System Engineering | C/Various | MITRE : Bedford, MA | 13.156 | 0.000 | | - | | - | | - | | - | 0.000 | 13.156 | - |
| AOC WS Inc 10.2 Program Management Administration | C/Various | Various : Hanscom AFB, MA | 9.945 | 0.886 | Nov 2017 | - | | - | | - | | - | 0.000 | 10.831 | - |
| Subtotal | | | 23.101 | 0.886 | | - | | - | | - | | - | 0.000 | 23.987 | N/A |

| | | | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|--|--|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|
| Project Cost Totals | | | 162.711 | 4.666 | 0.000 | - | - | - | 0.000 | 167.377 | N/A |

Remarks

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0605458F / Air & Space Ops Center 10.2 RDT&E | Project (Number/Name) 654945 / AOC 10.2 Development |

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
|--|--|
| AOC WS Inc 10.2 | |
| AOC WS Inc 10.2 Termination/Cancellation | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0605458F / Air & Space Ops Center 10.2 RDT&E | Project (Number/Name) 654945 / AOC 10.2 Development |

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| AOC WS Inc 10.2 | | | | |
| AOC WS Inc 10.2 Termination/Cancellation | 1 | 2018 | 2 | 2019 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0605830F / <i>Acq Workforce- Global Battle Mgmt</i> |
|---|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|--|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 0.000 | 3.617 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 3.617 |
| 65830A: <i>f-acq workforce-global battle mgmt (direct)</i> | - | 0.000 | 3.617 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 3.617 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | - | - |

A. Mission Description and Budget Item Justification

This program element is one of eight direct funded AFLCMC acquisition workforce program elements. The other seven acquisition workforce civilian pay program elements are 0605826F Global Power, 0605827 Global Vigilance and Combat Systems, 0605828F Global Reach, 0605829F Global Cyber, Network, and Business Systems, 0605831F Capability Integration, 0605832F Advanced Program Technology, and 0605898F Management Headquarters.

The Air Force Life Cycle Management Center (AFLCMC) equips U.S. and allied forces with operational weapon systems in support of military and national security operations. The acquisition and product support workforce provides cutting edge weapon systems, sustainment capabilities, and is charged with providing management, tools, and technical and business capabilities needed to oversee acquisition programs throughout their life cycle. The direct funded acquisition workforce funded in this program element will support all phases of acquisition programs to include material solution analysis, technology development, engineering and manufacturing development, production and deployment, and operations and support. This funding does not include costs for base operating support civilian personnel. These program elements support both civilian pay and non-pay support requirements.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|--|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0605830F / <i>Acq Workforce- Global Battle Mgmt</i> |
|---|--|

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 0.000 | 3.617 | 3.686 | 0.000 | 3.686 |
| Current President's Budget | 0.000 | 3.617 | 0.000 | 0.000 | 0.000 |
| Total Adjustments | 0.000 | 0.000 | -3.686 | 0.000 | -3.686 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | -3.686 | 0.000 | -3.686 |

Change Summary Explanation

In FY20, no change.

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
|---|----------------|----------------|----------------|

| | | | |
|---|-------|-------|-------|
| <p>Title: Acquisition Support</p> <p>Description: The acquisition and product support workforce provides cutting edge weapon systems sustainment capabilities and is charged with providing management, tools, and technical and business capabilities need to oversee acquisition programs throughout their life cycle.</p> <p>FY 2019 Plans: FY19 includes costs associated with the acquisition and product support workforce; provides cutting edge weapon systems sustainment capabilities and is charged with providing management, tools, and technical and business capabilities needed to oversee acquisition programs throughout their life cycle.</p> <p>N/A</p> <p>FY 2020 Plans: FY20 includes costs associated with the acquisition and product support workforce; provides cutting edge weapon systems sustainment capabilities and is charged with providing management, tools, and technical and business capabilities needed to oversee acquisition programs throughout their life cycle.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p> | 0.000 | 3.617 | 0.000 |
|---|-------|-------|-------|

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|--|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0605830F / <i>Acq Workforce- Global Battle Mgmt</i> |
|---|--|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| In FY20, the increase \$.069M is due to inflation for civilian pay. | | | |
| Accomplishments/Planned Programs Subtotals | 0.000 | 3.617 | 0.000 |

| D. Other Program Funding Summary (\$ in Millions) | | | | | | | | | | | |
|--|----------------|----------------|-------------------------|------------------------|--------------------------|----------------|----------------|----------------|----------------|-----------------------------|-------------------|
| Line Item | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| • RDTE 06 PE 0608526F: <i>Acq Workforce Global Power</i> | 219.809 | 233.924 | 261.544 | - | 261.544 | 274.280 | 279.643 | 284.862 | 290.402 | Continuing | Continuing |
| • RDTE 06 PE 0608527F: <i>Acq Workforce Global Vigilance and Combat Systems</i> | 228.179 | 263.488 | 254.878 | - | 254.878 | 259.208 | 265.881 | 271.796 | 277.907 | Continuing | Continuing |
| • RDTE 06 PE 0608528F: <i>Acq Workforce Global Reach</i> | 138.556 | 153.991 | 150.900 | - | 150.900 | 154.875 | 158.973 | 162.532 | 156.248 | Continuing | Continuing |
| • RDTE 06 PE 0608529F: <i>Acq Workforce Cyber, Network, and Business Systems</i> | 206.393 | 232.315 | 237.921 | - | 237.921 | 245.924 | 257.643 | 265.555 | 276.630 | Continuing | Continuing |
| • RDTE 06 PE 0608530F: <i>Acq Workforce Global Battle Management</i> | 147.577 | 169.868 | 158.345 | - | 158.345 | 165.769 | 169.907 | 173.523 | 177.262 | Continuing | Continuing |
| • RDTE 06 PE 0608531F: <i>Acq Workforce Capability Integration</i> | 217.061 | 226.219 | 222.577 | - | 222.577 | 227.139 | 232.203 | 236.710 | 241.216 | Continuing | Continuing |
| • RDTE 06 PE 0608532F: <i>Acq Workforce Advanced Program Technology</i> | 28.322 | 38.400 | 42.877 | - | 42.877 | 43.952 | 44.878 | 45.699 | 46.553 | Continuing | Continuing |
| • RDTE 06 PE 0608598F: <i>Management HQ - R&D</i> | 5.510 | 5.987 | 4.072 | - | 4.072 | 3.661 | 3.839 | 4.062 | 4.214 | Continuing | Continuing |

Remarks
N/A

E. Acquisition Strategy
N/A

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|--|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0605830F / <i>Acq Workforce- Global Battle Mgmt</i> |
|---|--|

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|--|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0605830F / Acq Workforce- Global Battle Mgmt | Project (Number/Name) 65830A / f-acq workforce-global battle mgmt (direct) |
|--|---|--|

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---------------------------------|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Acquisition Support | Various | Not specified. : TBD | - | 0.000 | | 3.517 | Oct 2018 | 0.000 | Oct 2019 | - | | 0.000 | Continuing | Continuing | - |
| Subtotal | | | - | 0.000 | | 3.517 | | 0.000 | | - | | 0.000 | Continuing | Continuing | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Acquisition Support | Various | Not specified. : TBD | - | - | | 0.100 | Jan 2019 | 0.000 | Jan 2019 | - | | 0.000 | Continuing | Continuing | - |
| Subtotal | | | - | - | | 0.100 | | 0.000 | | - | | 0.000 | Continuing | Continuing | N/A |

| | | | Prior Years | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|--|--|-------------|---------|--|---------|--|--------------|--|-------------|--|---------------|------------------|------------|--------------------------|
| Project Cost Totals | | | - | 0.000 | | 3.617 | | 0.000 | | - | | 0.000 | Continuing | Continuing | N/A |

Remarks
N/A

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0605830F / <i>Acq Workforce- Global Battle Mgmt</i> | Project (Number/Name) 65830A / <i>f-acq workforce-global battle mgmt (direct)</i> |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|----------------------------|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| Acquisition Support | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Acquisition Support | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0605830F / <i>Acq Workforce- Global Battle Mgmt</i> | Project (Number/Name) 65830A / <i>f-acq workforce-global battle mgmt (direct)</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|----------------------------|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| Acquisition Support | | | | |
| Acquisition Support | 1 | 2019 | 4 | 2020 |

Note
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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0605931F / <i>B-2 Defensive Management System</i> |
|---|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | 1,267.408 | 148.946 | 253.258 | 294.400 | 0.000 | 294.400 | 164.610 | 72.100 | 0.184 | 0.000 | 0.000 | 2,200.906 |
| 653844: <i>B-2 DMS</i> | 1,267.408 | 148.946 | 253.258 | 294.400 | 0.000 | 294.400 | 164.610 | 72.100 | 0.184 | 0.000 | 0.000 | 2,200.906 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | - | - |

Program MDAP/MAIS Code: 431

A. Mission Description and Budget Item Justification

The Defensive Management System Modernization (DMS-M) program enhances the B-2 direct attack capability by addressing emerging and future 21st century threats and robust modern Integrated Air Defense Systems (IADS). By leveraging "state-of-the-art" electronic warfare antennae, processors, controllers and displays, B-2 aircrews will realize unprecedented situational battlespace awareness and dynamic, real-time threat avoidance in the most complex radio frequency emitter environments. The inherent increased sensitivity of the modernized DMS over the legacy system, with increased processing power, will build a battlespace picture that could be shared with joint force platforms by on-board communication systems. The current B-2 DMS was designed in the 1980s and has not received any upgrades to date. Also, many components of the legacy DMS are not supportable and will severely impact aircraft availability without significant investment in reliability and maintainability upgrades.

During development, the engineering baseline will be finalized and four production representative kits will be procured to support integrated development/operational test and a pre-Milestone C Operational Assessment, as well as B-2 Nuclear Certification testing. Diminishing manufacturing sources and materiel shortages for affected components and subassemblies, will be addressed to protect the planned production program by mitigating unplanned part redesign and requalification risks.

Funds may be used to resolve emerging safety of flight and diminishing manufacturing sources issues, accommodate technology insertion and fulfill FAA or other mandates necessary to ensure continued aircrew safety and mission effectiveness.

The Milestone Decision Authority (MDA) approved an updated Acquisition Strategy and signed an Acquisition Decision Memorandum (ADM) on May 11, 2017. The ADM authorized the program to change the technical architecture and contract type via Engineering Change Proposal (ECP). DMS-M awarded a Firm Fixed Price (FFP) Unfixed Contract Action (UCA) on May 24, 2017 to implement the changes. EMD period of performance was extended through July 2022. The revised program strategy leverages development from other Air Force Family of Systems programs and implements additional, classified capability to improve weapon system survivability in contested airspace. The strategy also provides risk reduction and addresses obsolescence concerns for other programs. The Air Force Cost Accounting Agency (AFCAA) updated the Service Cost Position (SCP) on June 4, 2018 to reflect the new strategy.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver B-2 DMS-M weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, and 0605898F.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force</i> / BA 5: <i>System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0605931F / <i>B-2 Defensive Management System</i> |
|--|--|

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 194.570 | 261.758 | 135.684 | 0.000 | 135.684 |
| Current President's Budget | 148.946 | 253.258 | 294.400 | 0.000 | 294.400 |
| Total Adjustments | -45.624 | -8.500 | 158.716 | 0.000 | 158.716 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | -40.200 | -8.500 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -5.424 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 158.716 | 0.000 | 158.716 |

Change Summary Explanation

FY 2018 reductions were a Congressional mark of \$40.200M due to changes in acquisition strategy, and \$5.424M for Small Business Innovative Research (SBIR).

FY 2019 reduction was a Congressional mark of \$8.5M due to forward financing.

FY20 increase reflects new Service Cost Position approved 4 Jun 18.

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| Title: B-2 Defensive Management System Modernization (DMS-M) EMD | 148.946 | 253.258 | 294.400 |
| Description: DMS Modernization program develops improved aircrew situational awareness through replacement of passive antennas, receiver/processors, and display processors. DMS-M also addresses critical system shortfalls, and improves legacy DMS component repair issues. | | | |
| FY 2019 Plans: | | | |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|--|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0605931F / <i>B-2 Defensive Management System</i> |
|---|--|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| Continue working EMD efforts, complete PD7.1 software certification and begin ground/flight test. | | | |
| <i>FY 2020 Plans:</i> Continue working EMD efforts, complete PD7.2 software certification, and execute Milestone C and continue flight test. | | | |
| <i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> Funding increase due to increase in scope of development work with change in acquisition strategy. | | | |
| Accomplishments/Planned Programs Subtotals | 148.946 | 253.258 | 294.400 |

D. Other Program Funding Summary (\$ in Millions)

| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> <u>Base</u> | <u>FY 2020</u> <u>OCO</u> | <u>FY 2020</u> <u>Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To</u> <u>Complete</u> | <u>Total Cost</u> |
|--|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|
| • APAF 05 Line Item b2dms0: <i>B-2 DMS</i> | - | 0.000 | 0.000 | - | 0.000 | 328.000 | 294.500 | 88.872 | 78.130 | 0.000 | 789.502 |
| • APAF 06 Line Items 000999: <i>Acft Initial Spares & Repairs</i> | - | - | - | - | - | 0.000 | 58.500 | 15.404 | 15.681 | 0.000 | 89.585 |
| • APAF 07 Line Item 000075: <i>Other Production Charges</i> | - | - | 0.000 | - | 0.000 | 0.020 | 14.300 | 12.855 | 13.127 | 0.000 | 40.302 |

Remarks

E. Acquisition Strategy
 Key elements of the overall acquisition strategy include: use of sole source contract with a prime/integrating contractor (Northrop Grumman) who will perform subsystem and component competitions where appropriate, use of Firm Fixed Price (FFP) development contract, and the combination of developmental upgrades with software sustainment blocks to minimize the number of software releases, aircraft downtime, and differences in fielded configurations. The May 2017 acquisition strategy changed the design architecture to leverage mature systems from other platforms to reduce risk and refocus effort to integrate common unmodified hardware.

F. Performance Metrics
 Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0605931F / B-2 Defensive Management System | Project (Number/Name) 653844 / B-2 DMS |
|--|---|--|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Air Vehicle - Technology Development | SS/CPFF | Various : Various, NV | 726.260 | - | | - | | - | | - | | - | 0.000 | 726.260 | - |
| Air Vehicle - Engineering and Manufacturing Development (EMD) | SS/FFP | Various : Various, NV | 477.086 | 103.774 | Oct 2017 | 196.120 | Oct 2018 | 174.266 | Oct 2019 | - | | 174.266 | 162.841 | 1,114.087 | - |
| Subtotal | | | 1,203.346 | 103.774 | | 196.120 | | 174.266 | | - | | 174.266 | 162.841 | 1,840.347 | N/A |

Remarks
Northrop-Grumman, Palmdale, CA is the prime contractor and integrator.

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---------------------------------|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Trainers | C/CPIF | WPAFB : Dayton, OH | 0.000 | 14.934 | Dec 2017 | 7.534 | Nov 2018 | 17.966 | Nov 2019 | - | | 17.966 | 11.966 | 52.400 | - |
| Mission Planning | C/CPIF | Hanscom : Boston, MA | 0.000 | 5.143 | Nov 2017 | 8.461 | Feb 2019 | 22.271 | Feb 2020 | - | | 22.271 | 1.822 | 37.697 | - |
| Subtotal | | | 0.000 | 20.077 | | 15.995 | | 40.237 | | - | | 40.237 | 13.788 | 90.097 | N/A |

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Government Test | MIPR | AFMTC : Various, NV | 21.426 | 7.973 | Oct 2017 | 16.470 | Oct 2018 | 20.400 | Oct 2019 | - | | 20.400 | 1.471 | 67.740 | - |
| Subtotal | | | 21.426 | 7.973 | | 16.470 | | 20.400 | | - | | 20.400 | 1.471 | 67.740 | N/A |

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0605931F / B-2 Defensive Management System | Project (Number/Name) 653844 / B-2 DMS |
|--|---|--|

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| PMA | Various | Various : Various, NV | 42.636 | 17.122 | Nov 2017 | 24.673 | Nov 2018 | 59.497 | Nov 2019 | - | | 59.497 | 58.794 | 202.722 | - |
| Subtotal | | | 42.636 | 17.122 | | 24.673 | | 59.497 | | - | | 59.497 | 58.794 | 202.722 | N/A |

Remarks
PMA increases from FY18 to FY19 and FY19 to FY20 reflect the allocation across all B-2 programs; B-2 DMS is the largest program and therefore pays the largest share with significant increase after the termination of EHF SATCOM.

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|
| Project Cost Totals | 1,267.408 | 148.946 | 253.258 | 294.400 | - | 294.400 | 236.894 | 2,200.906 | N/A |

Remarks
Northrop-Grumman, the prime contractor for the B-2 weapon system, is the integrator and prime contractor for B-2 DMS activities.

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force **Date:** February 2019

| | | |
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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0605931F / B-2 Defensive Management System | Project (Number/Name) 653844 / B-2 DMS |
|--|---|--|

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| B-2 DMS | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DMS-M EMD | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DMS-M Critical Design Review | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DMS-M Combined Developmental Test / Operational Test (DT/OT) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DMS-M Milestone C - Low Rate Initial Production (LRIP) Decision | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DMS-M Production | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DMS-M Full Rate Production (FRP) Decision | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DMS-M Certification of Airworthiness | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0605931F / <i>B-2 Defensive Management System</i> | Project (Number/Name) 653844 / <i>B-2 DMS</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|---|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>B-2 DMS</i> | | | | |
| DMS-M EMD | 1 | 2018 | 3 | 2022 |
| DMS-M Critical Design Review | 4 | 2018 | 4 | 2018 |
| DMS-M Combined Developmental Test / Operational Test (DT/OT) | 3 | 2019 | 2 | 2021 |
| DMS-M Milestone C - Low Rate Initial Production (LRIP) Decision | 4 | 2020 | 4 | 2020 |
| DMS-M Production | 1 | 2021 | 4 | 2024 |
| DMS-M Full Rate Production (FRP) Decision | 3 | 2022 | 3 | 2022 |
| DMS-M Certification of Airworthiness | 2 | 2021 | 3 | 2022 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force / BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0101125F / <i>Nuclear Weapons Modernization</i> |
|---|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | 576.652 | 81.631 | 81.592 | 27.564 | 0.000 | 27.564 | 9.700 | 0.000 | 0.000 | 0.000 | 0.000 | 777.139 |
| 657007: <i>B61 LIFE EXTENSION PROGRAM</i> | 576.652 | 81.631 | 81.592 | 27.564 | 0.000 | 27.564 | 9.700 | 0.000 | 0.000 | 0.000 | 0.000 | 777.139 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | - | - |

Program MDAP/MAIS Code: 468

A. Mission Description and Budget Item Justification

The purpose of this program element is to conduct and support United States Air Force (USAF) and Joint Department of Defense (DoD) / Department of Energy (DOE) acquisition activities for the modernization of nuclear weapons.

B61-12 Life Extension Program (LEP): The B61-12 LEP will integrate DOE efforts to extend the service life of the warhead with DoD efforts to develop a guided Tail Kit Assembly (TKA) required to maintain current B61 mission characteristics. Programmatic integration of the Air Force-led, joint DoD-DOE program is accomplished through the B61 LEP Project Officers Group (POG) and its subgroups. In accordance with Air Force Materiel Command mission assignment memo (dated 17 Feb 11) and National Nuclear Security Administration (NNSA)-Air Force Nuclear Weapons Center (AFNWC) Memorandum of Understanding (MOU dated 28 Jun 12), the USAF is responsible for development, acquisition and delivery of a guided TKA and All Up Round (AUR) technical integration, system qualification and fielding of the B61-12 variant on multiple platforms.

Funds may be used to address emerging and short-notice Diminishing Manufacturing Sources and Material Shortage (DMSMS) issues.

This program element includes necessary civilian pay expenses required to manage, execute, and deliver B-61 weapon system capability. The use of such program funds is in addition to the civilian pay expenses budgeted in program element 0605833F-Nuclear Systems.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0101125F / <i>Nuclear Weapons Modernization</i> |
|---|--|

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 91.237 | 91.907 | 36.164 | 0.000 | 36.164 |
| Current President's Budget | 81.631 | 81.592 | 27.564 | 0.000 | 27.564 |
| Total Adjustments | -9.606 | -10.315 | -8.600 | 0.000 | -8.600 |
| • Congressional General Reductions | 0.000 | -3.500 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | -6.400 | -6.815 | | | |
| • SBIR/STTR Transfer | -3.206 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | -8.600 | 0.000 | -8.600 |

Change Summary Explanation

FY 2018 Reprogrammings include: \$0.3M BTR to ALCM; \$4.0M BTR to GBSD; and \$2.1M BTR to LRSO.

FY 2019 Reprogrammings include: \$6.815M FFRDC and \$3.5M mark for test support excess to need .

FY 2020 Other Adjustments include: \$8.6M reduction aligns program to the October 2018 Milestone C Service Cost Position.

C. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| Title: Engineering & Manufacturing Development Contract (B61) | 28.723 | 32.859 | 12.388 | 0.000 | 12.388 |
| Description: Prime contract to develop, test, integrate and nuclear certify a guided TKA in support of the B61-12 LEP. | | | | | |
| FY 2019 Plans: Continues B61-12 TKA test, integration, qualification and nuclear certification activities in support of the B61-12 LEP. Continues integration and testing of the B61-12 system, verification of requirements and validation of TKA performance. Continues all-up round system and IOT&E flight testing to validate aircraft flight environments in support of weapon development. Continues B61-12 TKA program practices that ensure the following are met: requirements flow down, requirement allocation to hardware and software, requirements compliance matrix, system performance, reliability, maintainability, product assurance, testability, producibility and supportability. | | | | | |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | | | Date: February 2019 | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | | R-1 Program Element (Number/Name) PE 0101125F / <i>Nuclear Weapons Modernization</i> | | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | | | | |
| Provides support to aircraft Operational Flight Plan (OFP) development and integration to deliver the OFP test tapes in support of IOT&E. | | | | | |
| FY 2020 Base Plans: Continues B61-12 TKA test, integration, qualification and nuclear certification activities in support of the B61-12 LEP. Continues integration and testing of the B61-12 system, verification of requirements and validation of TKA performance. Continues all-up round system and IOT&E flight testing to validate aircraft flight environments in support of weapon development. Continues B61-12 TKA program practices that ensure the following are met: requirements flow down, requirement allocation to hardware and software, requirements compliance matrix, system performance, reliability, maintainability, product assurance, testability, producibility and supportability. Provides support to aircraft Operational Flight Plan (OFP) development and integration to deliver the OFP test tapes in support of IOT&E. | | | | | |
| FY 2020 OCO Plans: NA | | | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: Funding decreased to align with overall program schedule and associated ramp down in EMD test activities. | | | | | |
| Title: All Up Round (AUR) Technical Integration (B61) | | | | | |
| Description: Covers all system engineering tasks in support of AUR technical integration, qualification & fielding, including program support to the B61 LEP POG. | | | | | |
| FY 2019 Plans: Continues B61-12 system qualification plan, warhead component qualification, TKA qualifications, and B61-12 AUR integration activities. Continues support to maintain technical and programmatic schedules and program documents that support the AUR technical integration. Continues maintenance of warhead-to-TKA interface requirements and design. Continues to provide technical expertise to maintain B61-12 aircraft compatibility with platforms through completion of the test and evaluation program. Continues to develop test assets to support integration and sustainment efforts at the aircraft system integration laboratories. Includes B61-12 AUR technical and programmatic reviews, including design reviews, systems reviews, technical interchange meetings, and test reviews. Also includes test assessments to validate modeling and simulation results in support of system qualification; configuration management of B61-12 AUR drawings, interface control documents, and system specifications; and support of trainers and other USAF-owned, DOE-designed configurations such as the Code Management System and ancillary equipment. Provides for management of system security requirements. | | | | | |
| | 9.844 | 7.914 | 0.100 | 0.000 | 0.100 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|--|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0101125F / <i>Nuclear Weapons Modernization</i> |
|---|--|

C. Accomplishments/Planned Programs (\$ in Millions)

Provides AUR integration support to the DOE in support of System Qualification drops. Efforts support the AUR Design Review and Acceptance Group (DRAAG).

FY 2020 Base Plans:

Continues B61-12 system qualification plan, warhead component qualification, TKA qualifications, and B61-12 AUR integration activities. Continues support to maintain technical and programmatic schedules and program documents that support the AUR technical integration. Continues maintenance of warhead-to-TKA interface requirements and design. Continues to provide technical expertise to maintain B61-12 aircraft compatibility with platforms through completion of the test and evaluation program. Continues to develop test assets to support integration and sustainment efforts at the aircraft system integration laboratories. Includes B61-12 AUR technical and programmatic reviews, including design reviews, systems reviews, technical interchange meetings, and test reviews. Also includes test assessments to validate modeling and simulation results in support of system qualification; configuration management of B61-12 AUR drawings, interface control documents, and system specifications; and support of trainers and other USAF-owned, DOE-designed configurations such as the Code Management System and ancillary equipment. Provides for management of system security requirements. Provides AUR integration support to the DOE in support of System Qualification drops. Efforts support the AUR Design Review and Acceptance Group (DRAAG).

FY 2020 OCO Plans:

NA

FY 2019 to FY 2020 Increase/Decrease Statement:

Funding decreased to align to overall program schedule and associated ramp down in AUR integration activities.

Title: Aircraft Integration (B61)

Description: B61-12 activities associated with integration on threshold aircraft, including mission planning system upgrades to accommodate the new weapon variant. Also includes activities related to weapon design compatibility with both threshold and objective aircraft.

FY 2019 Plans:

Continues aircraft F-15E integration activities and continues B-2 integration.

FY 2020 Base Plans:

Continues aircraft F-15E integration activities and completes B-2 integration.

FY 2020 OCO Plans:

| | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|---------|---------|--------------|-------------|---------------|
| <p>Provides AUR integration support to the DOE in support of System Qualification drops. Efforts support the AUR Design Review and Acceptance Group (DRAAG).</p> <p><i>FY 2020 Base Plans:</i> Continues B61-12 system qualification plan, warhead component qualification, TKA qualifications, and B61-12 AUR integration activities. Continues support to maintain technical and programmatic schedules and program documents that support the AUR technical integration. Continues maintenance of warhead-to-TKA interface requirements and design. Continues to provide technical expertise to maintain B61-12 aircraft compatibility with platforms through completion of the test and evaluation program. Continues to develop test assets to support integration and sustainment efforts at the aircraft system integration laboratories. Includes B61-12 AUR technical and programmatic reviews, including design reviews, systems reviews, technical interchange meetings, and test reviews. Also includes test assessments to validate modeling and simulation results in support of system qualification; configuration management of B61-12 AUR drawings, interface control documents, and system specifications; and support of trainers and other USAF-owned, DOE-designed configurations such as the Code Management System and ancillary equipment. Provides for management of system security requirements. Provides AUR integration support to the DOE in support of System Qualification drops. Efforts support the AUR Design Review and Acceptance Group (DRAAG).</p> <p><i>FY 2020 OCO Plans:</i> NA</p> <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> Funding decreased to align to overall program schedule and associated ramp down in AUR integration activities.</p> <p><i>Title:</i> Aircraft Integration (B61)</p> <p><i>Description:</i> B61-12 activities associated with integration on threshold aircraft, including mission planning system upgrades to accommodate the new weapon variant. Also includes activities related to weapon design compatibility with both threshold and objective aircraft.</p> <p><i>FY 2019 Plans:</i> Continues aircraft F-15E integration activities and continues B-2 integration.</p> <p><i>FY 2020 Base Plans:</i> Continues aircraft F-15E integration activities and completes B-2 integration.</p> <p><i>FY 2020 OCO Plans:</i></p> | 28.090 | 18.986 | 14.523 | 0.000 | 14.523 |

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|---|--|--|----------------|----------------------------|--------------------|----------------------|
| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | | R-1 Program Element (Number/Name) PE 0101125F / <i>Nuclear Weapons Modernization</i> | | | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
| No 2020 OCO | | | | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: Funding decreased to align with overall program schedule and associated ramp down in aircraft integration activities. | | | | | | |
| Title: Test Support (B61) | | 14.974 | 21.833 | 0.553 | 0.000 | 0.553 |
| Description: Test activities and support for TKA design validation & verification and nuclear certification, as well as B61-12 AUR system qualification (includes design and operational certification activities). | | | | | | |
| FY 2019 Plans: Continues test planning and execution activities to support B61-12 weapon development, AUR technical integration and aircraft integration. Continues flight testing to verify aircraft flight environments and TKA and AUR design verification during IOT&E and AUR System Qualification drops. Continues development and delivery of necessary BAs to accomplish TKA test and trainer activities. Continues providing support to the DOE flight tests for the bomb assembly. Continues execution of B-2, F-15E, F-16 system qualification testing for B61-12 AUR and B-2 mission planning. | | | | | | |
| FY 2020 Base Plans: Continues test planning and execution activities to support B61-12 weapon development, AUR technical integration and aircraft integration. Continues flight testing to verify aircraft flight environments and TKA and AUR design verification during IOT&E and AUR System Qualification drops. Continues development and delivery of necessary BAs to accomplish TKA test and trainer activities. Continues providing support to the DOE flight tests for the bomb assembly. Continues execution of B-2, F-15E, F-16 system qualification testing for B61-12 AUR and B-2 mission planning. | | | | | | |
| FY 2020 OCO Plans: NA | | | | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: Funding decreased to align with overall program schedule and associated ramp down in test support activities. | | | | | | |
| Accomplishments/Planned Programs Subtotals | | 81.631 | 81.592 | 27.564 | 0.000 | 27.564 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|--|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0101125F / <i>Nuclear Weapons Modernization</i> |
|---|--|

D. Other Program Funding Summary (\$ in Millions)

| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> <u>Base</u> | <u>FY 2020</u> <u>OCO</u> | <u>FY 2020</u> <u>Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To</u> <u>Complete</u> | <u>Total Cost</u> |
|-------------------------------------|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|
| • PAAF 01 11125F/354040: <i>B61</i> | 74.907 | 152.223 | 0.000 | 80.773 | 80.773 | 35.720 | 2.800 | 0.000 | 0.000 | 0.000 | 346.423 |

Remarks

E. Acquisition Strategy

The Milestone Decision Authority directed a three-fold competitive acquisition strategy at the 30 April 2012 Materiel Development Decision. 1) A single prime contractor was chosen to develop the B61-12 TKA through Engineering Manufacturing and Development (EMD) using full and open competition. EMD consists of two phases; 2) the prime contractor is to maintain competition at the subcomponent level; and 3) a sole source contract was awarded for production to the EMD contractor.

MS-C in 1QFY19 approved entry into Low Rate Initial Production/Lot 1 and the purchase of both long-lead items and life-of-type buys supporting Lot 2 Advanced Procurement for Full Rate Production.

B61-12 AUR integration, qualification and acceptance will be conducted through the joint DoD-DOE/NNSA Phase 6.X process and managed through the B61 LEP Project Officers Group (POG). Sandia National Laboratory will conduct the TKA/BA technical integration on behalf of the Air Force.

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|--|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0101125F / <i>Nuclear Weapons Modernization</i> | Project (Number/Name) 657007 / <i>B61 LIFE EXTENSION PROGRAM</i> |
|--|--|--|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| B61 LEP EMD Contracts | C/CPIF | Boeing : St Charles, MO | 288.340 | 23.419 | Oct 2017 | 25.287 | Mar 2019 | 8.706 | Nov 2019 | - | | 8.706 | 0.000 | 345.752 | 0.000 |
| Subtotal | | | 288.340 | 23.419 | | 25.287 | | 8.706 | | - | | 8.706 | 0.000 | 345.752 | N/A |

Remarks
 FY19 EMD contract cost increase aligns with program schedule, continued AUR system qualification testing and IOT&E in 2Q-4Q FY19.
 FY20 EMD contract cost decrease aligns with program schedule and associated ramp down in program testing.
 EMD Phase II Period of Performance extended until December 2019.

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---------------------------------|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| AUR Technical Integration | MIPR | Various : various | 57.890 | 9.844 | Jan 2018 | 7.914 | Mar 2019 | 0.100 | Jun 2020 | - | | 0.100 | 0.000 | 75.748 | - |
| Aircraft Integration | MIPR | Various : various | 141.610 | 28.090 | Nov 2017 | 18.986 | Feb 2019 | 14.523 | Jan 2020 | - | | 14.523 | 8.728 | 211.937 | - |
| Subtotal | | | 199.500 | 37.934 | | 26.900 | | 14.623 | | - | | 14.623 | 8.728 | 287.685 | N/A |

Remarks
 FY20 AUR Technical Integration cost decrease aligns with program schedule and ramp down in integration activities.
 FY19 & FY20 Aircraft Integration cost decrease aligns with program schedule and ramp down in aircraft integration activities.

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Test Support for B61 LEP Development | PO | 96 TW : Eglin, FL | 55.842 | 9.034 | Nov 2017 | 12.972 | Feb 2019 | 0.553 | Jan 2020 | - | | 0.553 | 0.000 | 78.401 | - |
| 526.1 Assets | MIPR | Various : Various | 0.000 | 5.940 | Jul 2018 | 8.861 | Feb 2019 | - | | - | | - | 0.000 | 14.801 | - |
| Subtotal | | | 55.842 | 14.974 | | 21.833 | | 0.553 | | - | | 0.553 | 0.000 | 93.202 | N/A |

Remarks
 FY20 Test Support cost decrease aligns with program schedule and ramp down in test activities.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|--|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0101125F / <i>Nuclear Weapons Modernization</i> | Project (Number/Name) 657007 / <i>B61 LIFE EXTENSION PROGRAM</i> |
|--|--|--|

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| PMA | Various | various : various | 32.970 | 5.304 | Oct 2017 | 7.572 | Feb 2019 | 3.682 | Dec 2019 | - | | 3.682 | 0.972 | 50.500 | - |
| Subtotal | | | 32.970 | 5.304 | | 7.572 | | 3.682 | | - | | 3.682 | 0.972 | 50.500 | N/A |

Remarks
FY20 PMA cost decrease aligns with program schedule and ramp down in integration and test activities.

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|
| Project Cost Totals | 576.652 | 81.631 | 81.592 | 27.564 | - | 27.564 | 9.700 | 777.139 | N/A |

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force

Date: February 2019

Appropriation/Budget Activity
3600 / 5

R-1 Program Element (Number/Name)
PE 0101125F / Nuclear Weapons
Modernization

Project (Number/Name)
657007 / B61 LIFE EXTENSION
PROGRAM

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| B61 LIFE EXTENSION PROGRAM | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Engineering & Manufacturing Development Phase 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Engineering & Manufacturing Development Phase 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| All-Up-Round Developmental/System Qualification Testing | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ground Test/WTT/Flight Test | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Aircraft Integration | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TKA Milestone C Decision | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0101125F / <i>Nuclear Weapons Modernization</i> | Project (Number/Name) 657007 / <i>B61 LIFE EXTENSION PROGRAM</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|---|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>B61 LIFE EXTENSION PROGRAM</i> | | | | |
| Engineering & Manufacturing Development Phase 1 | 1 | 2018 | 1 | 2018 |
| Engineering & Manufacturing Development Phase 2 | 1 | 2018 | 1 | 2020 |
| All-Up-Round Developmental/System Qualification Testing | 1 | 2018 | 2 | 2020 |
| Ground Test/WTT/Flight Test | 1 | 2018 | 2 | 2020 |
| Aircraft Integration | 1 | 2018 | 3 | 2021 |
| TKA Milestone C Decision | 1 | 2019 | 1 | 2019 |

Note

USD AT&L directed B61-12 TKA to enter acquisition process at Milestone B based on maturity of the technology required for this program. Therefore, a separate Technology Development phase is not required. (Source: Materiel Development Decision (MDD) Acquisition Decision Memorandum (ADM), signed 30 April 2012)

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|--|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0101213F / <i>Minuteman Squadrons</i> |
|---|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|--------------------------------------|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 0.000 | 0.000 | 0.001 | 0.000 | 0.001 | 0.000 | 0.001 | 0.001 | 0.002 | Continuing | Continuing |
| 657010: <i>Operational Equipment</i> | - | 0.000 | 0.000 | 0.001 | 0.000 | 0.001 | 0.000 | 0.001 | 0.001 | 0.002 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

Mission Description not provided.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

| <u>B. Program Change Summary (\$ in Millions)</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020 Base</u> | <u>FY 2020 OCO</u> | <u>FY 2020 Total</u> |
|--|-----------------------|-----------------------|----------------------------|---------------------------|-----------------------------|
| Previous President's Budget | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Current President's Budget | 0.000 | 0.000 | 0.001 | 0.000 | 0.001 |
| Total Adjustments | -13.637 | -1.314 | 0.001 | 0.000 | 0.001 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | -1.314 | | | |
| • Congressional Rescissions | -7.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -6.637 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 0.001 | 0.000 | 0.001 |

Change Summary Explanation

FY 2018 funding reflects a below threshold reprogramming of \$7.000M to PE 0605320F for higher Air Force priorities.

FY 2018 funding reflects an FFRDC adjustment of \$6.637M.

FY 2019 funding reflects a Congressional Directed Reduction of \$1.314M for the Fast Rising B-plug program.

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|---|--|----------------------------|
| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0101213F / <i>Minuteman Squadrons</i> | |
| C. Accomplishments/Planned Programs (\$ in Millions) N/A | | |
| D. Other Program Funding Summary (\$ in Millions) N/A | | |
| Remarks | | |
| E. Acquisition Strategy N/A | | |
| F. Performance Metrics Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission. | | |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0207171F / F-15 EPAWSS |
|---|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|-----------------------------------|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | 467.900 | 202.167 | 137.095 | 47.322 | 0.000 | 47.322 | 23.942 | 12.269 | 0.000 | 0.000 | 0.000 | 890.695 |
| 657108: <i>EPAWSS DEVELOPMENT</i> | 467.900 | 202.167 | 137.095 | 47.322 | 0.000 | 47.322 | 23.942 | 12.269 | 0.000 | 0.000 | 0.000 | 890.695 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | - | - |

Program MDAP/MAIS Code: 485

Note

In FY 2016, PE 0207171F, F-15 EPAWSS, Project 676038, EPAWSS, Budget Activity 07, Operational Systems Development was transferred to PE 0207171F, F-15 EPAWSS, Project 657108, EPAWSS Development, Budget Activity 05, System Development and Demonstration to align the program in the correct budget activity.

In FY 2015, PE 0207134F, F-15E Squadrons, Project 670131, Initial Operational Test and Evaluation, F-15 EPAWSS development efforts were transferred to PE 0207171F, F-15 EPAWSS, Project 676038, EPAWSS in order to provide budget transparency.

Prior Years funding in FY 2013 and FY 2014 of \$15.100M was executed in PE 0207134F. Prior Year funding in FY 2015 of \$37.726M was executed in PE 0207171F, Project 676038.

A. Mission Description and Budget Item Justification

The current F-15's self-protection suite called the Tactical Electronic Warfare System (TEWS) is functionally obsolete. It uses 1970's analog technology designed for combat operations in environments defended by 1980s-era radar-based ground and air threats. In addition, this aging system is becoming more difficult and expensive to support. As a result, Air Force is replacing TEWS with the F-15 Eagle Passive/Active Warning and Survivability System (EPAWSS). F-15 EPAWSS is an advanced digital electronic warfare system capable of detecting, identifying, locating, denying, degrading, disrupting, and defeating modern and emerging threat systems in up to contested environments. This upgrade will significantly improve the F-15's capability to autonomously and automatically detect, identify and locate radio frequency (RF) threats as well as provide the ability to deny, degrade, deceive, disrupt and defeat RF and electro-optical/infrared (EO/IR) threat systems in contested and unplanned operations within highly contested environments through 2040. F-15 EPAWSS will provide indication, type and position of ground-based RF threats as well as the indication, type and bearing of airborne threats with the situational awareness needed to avoid, engage or negate the threat. It will also prevent RF and IR threat systems from detecting or acquiring accurate targeting information prior to threat engagement to complicate and/or negate an enemy threat targeting solution and effectively counter enemy missiles/weapons if adversary threat systems engage and employ weapons against friendly forces through components such as chaff, flares, decoys/angle countermeasures and jamming.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver F-15 EPAWSS capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, and 0605898F."

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0207171F / F-15 EPAWSS |
|---|---|

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 209.847 | 137.095 | 67.322 | 0.000 | 67.322 |
| Current President's Budget | 202.167 | 137.095 | 47.322 | 0.000 | 47.322 |
| Total Adjustments | -7.680 | 0.000 | -20.000 | 0.000 | -20.000 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -7.680 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | -20.000 | 0.000 | -20.000 |

Change Summary Explanation

FY18 reduction of \$7.680M for SBIR

FY20 decrease of \$20M for rephrased efforts to FY 2021 and 2022.

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| Title: Eagle Passive/Active Warning Survivability System (EPAWSS) | 202.167 | 137.095 | 47.322 |
| Description: Planned replacement of the existing F-15 self-protection, Tactical Electronic Warfare System (TEWS). This includes technical and acquisition related studies. | | | |
| FY 2019 Plans: Continue acquisition planning for Milestone C. Execute Increment 1 EMD. Execute Increment 1 flight tests. Continue to execute risk reduction, development test activities, and continue acquisition and technical-related studies for Increment 1. Funds may be | | | |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0207171F / <i>F-15 EPAWSS</i> |
|---|--|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| used to resolve emerging safety of flight issues, accommodate technology insertion and fulfill FAA or other mandates necessary to ensure continued aircrew safety and mission effectiveness. | | | |
| <i>FY 2020 Plans:</i> Complete test aircraft modifications. Continue Increment 1 ground and flight tests. Continue to execute risk reduction, development test activities, and continue acquisition and technical related studies for Increment 1. Funds may be used to resolve emerging safety of flight issues, accommodate technology insertion and fulfill FAA or other mandates necessary to ensure continued aircrew safety and mission effectiveness. | | | |
| <i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> FY 2019 to 2020 decrease \$89.773M due to completion of test aircraft activity and other efforts. | | | |
| Accomplishments/Planned Programs Subtotals | 202.167 | 137.095 | 47.322 |

| D. Other Program Funding Summary (\$ in Millions) | | | | | | | | | | | |
|--|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|
| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> <u>Base</u> | <u>FY 2020</u> <u>OCO</u> | <u>FY 2020</u> <u>Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To</u> <u>Complete</u> | <u>Total Cost</u> |
| • APAF 05 Line Item | - | 214.885 | 149.047 | - | 149.047 | 179.087 | 308.818 | 337.777 | 266.100 | 651.507 | 2,107.221 |
| F15EWS: <i>Aircraft Modification</i> | | | | | | | | | | | |
| • APAF 07 Line Item 000999: <i>Aircraft Spares and Repair Parts</i> | - | - | 4.185 | - | 4.185 | 8.046 | 10.214 | 19.605 | 11.100 | 11.679 | 64.829 |

Remarks
FY 2019 - FY 2023 funding is for F-15 E Increment 1 Procurement.

E. Acquisition Strategy
F-15 EPAWSS is using an evolutionary acquisition model consisting of two increments. Increment 1 replaces the existing radar warning receiver, internal countermeasure system and countermeasure dispenser system. Increment 2 adds a towed decoy and monopulse angle countermeasure capability. F-15 EPAWSS technical approach is to leverage mature technology where possible from other Air Force or Foreign Military Sales electronic warfare programs. To rapidly field this capability, F-15 EPAWSS is using two decision points in-lieu of a single Milestone C. Decision Point #1 will initiate production activities. Decision Point #2 will initiate installation activities. This tailoring provides the Milestone Decision Authority the ability to accelerate Initial Operating Capability by reducing the schedule impact of kit lead times.

F. Performance Metrics
Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0207171F / F-15 EPAWSS | Project (Number/Name) 657108 / EPAWSS DEVELOPMENT |
|--|---|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| F-15 EPAWSS TMRR | SS/ Various | Boeing : St. Louis, MO | 86.375 | - | | - | | - | | - | | - | 0.000 | 86.375 | 175.860 |
| F-15 EPAWSS EMD | SS/ Various | Boeing : St. Louis, MO | 168.745 | 154.895 | Oct 2017 | 112.923 | Feb 2019 | 29.596 | Feb 2020 | - | | 29.596 | 16.841 | 483.000 | 478.786 |
| F-15 EPAWSS | Various | Various : Various | 212.780 | 11.953 | Dec 2017 | 6.744 | Mar 2019 | 10.328 | Feb 2020 | - | | 10.328 | 5.215 | 247.020 | 115.854 |
| Subtotal | | | 467.900 | 166.848 | | 119.667 | | 39.924 | | - | | 39.924 | 22.056 | 816.395 | N/A |

Remarks
 FY16PB- EPAWSS efforts were transferred from Budget Activity 7, Operational Systems Development, PE 0207171F, Project Number 676038 to Budget Activity 5, Engineering and Manufacturing Development, PE 0207171F, Project Number 657108 per OSD direction.

The individual program reference to "various" contract methods addresses other government costs for trainers, hardware, special studies, etc., that are required to meet F-15 EPAWSS program objectives. The execution vehicles between these DoD entities vary by effort.

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Government Flight Test | Various | Various : Various | 0.000 | 18.531 | Jan 2018 | 14.208 | Jan 2019 | 6.201 | Jan 2020 | - | | 6.201 | 12.634 | 51.574 | 72.735 |
| Subtotal | | | 0.000 | 18.531 | | 14.208 | | 6.201 | | - | | 6.201 | 12.634 | 51.574 | N/A |

Remarks
 The individual program reference to "various" contract methods addresses other government costs for trainers, test, hardware, special studies, etc. that are required to meet F-15 EPAWSS program objectives. The execution vehicles between these DoD entities vary by effort.

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Program Management Support Costs | Various | Various : Various | 0.000 | 16.788 | Oct 2017 | 3.220 | Feb 2019 | 1.197 | Feb 2020 | - | | 1.197 | 1.521 | 22.726 | 44.399 |
| Subtotal | | | 0.000 | 16.788 | | 3.220 | | 1.197 | | - | | 1.197 | 1.521 | 22.726 | N/A |

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0207171F / F-15 EPAWSS | Project (Number/Name) 657108 / EPAWSS DEVELOPMENT |
|--|---|---|

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--------------------------------------|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |

Remarks
The individual program reference to "various" contract methods addresses other government costs for trainers, test, hardware, special studies, etc. that are required to meet F-15 EPAWSS program objectives. The execution vehicles between these DoD entities vary by effort.

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|
| Project Cost Totals | 467.900 | 202.167 | 137.095 | 47.322 | - | 47.322 | 36.211 | 890.695 | N/A |

Remarks
Prior Years funding in FY 2013 and FY 2014 of \$15.100M was executed in PE 0207134F.

Prior Year funding in FY 2015 of \$37.726M was executed in PE 0207171F, Project 676038.

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | | | | | | Date: February 2019 | | | | | | | | | | | | | |
| Appropriation/Budget Activity 3600 / 5 | | | | | | | R-1 Program Element (Number/Name) PE 0207171F / F-15 EPAWSS | | | | | | | Project (Number/Name) 657108 / EPAWSS DEVELOPMENT | | | | | | |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|----------------------------|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| F-15 EPAWSS | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| EPAWSS MS C | | | | | | | | ■ | | | | | | | | | | | | | | | | | | | | |
| EPAWSS Increment 1 testing | | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | | | |
| EPAWSS Decision Point 1 | | | | | | | | ■ | | | | | | | | | | | | | | | | | | | | |
| EPAWSS Decision Point 2 | | | | | | | | | | | | | ■ | | | | | | | | | | | | | | | |

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0207171F / <i>F-15 EPAWSS</i> | Project (Number/Name) 657108 / <i>EPAWSS DEVELOPMENT</i> |
|--|--|--|

Schedule Details

| Events by Sub Project | Start | | End | |
|----------------------------|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>F-15 EPAWSS</i> | | | | |
| EPAWSS MS C | 4 | 2019 | 4 | 2019 |
| EPAWSS Increment 1 testing | 1 | 2019 | 2 | 2021 |
| EPAWSS Decision Point 1 | 4 | 2019 | 4 | 2019 |
| EPAWSS Decision Point 2 | 4 | 2020 | 4 | 2020 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force / BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0207328F / <i>Stand In Attack Weapon</i> |
|---|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---------------------------------------|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 3.288 | 14.975 | 162.840 | 0.000 | 162.840 | 142.725 | 165.303 | 218.950 | 151.542 | Continuing | Continuing |
| 653133: <i>Stand In Attack Weapon</i> | - | 3.288 | 14.975 | 162.840 | 0.000 | 162.840 | 142.725 | 165.303 | 218.950 | 151.542 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

Stand In Attack Weapon (SiAW) system will provide strike capability to defeat rapidly relocatable targets that create the Anti-Access/Area Denial (A2/AD) environment. The target environment includes Theater Ballistic Missile Launchers, Land Attack and Anti-Ship Cruise Missile Launchers, GPS Jammers, Anti-Satellite Systems, and Integrated Air Defense Systems. Key attributes of the Stand-in Attack Weapon (SiAW) will include Lethality, Responsiveness, Survivability, Range, and Internal Carriage. The F-35 is the Air Force threshold platform. The path to the SiAW capability is through the Navy Advanced Anti-Radiation Guided Missile-Extended Range (AARGM-ER) program with additions to the Universal Armament Interface (UAI), Warhead/Fuze, and Integration on the F-35. SiAW was a FY18 new start. New start activities initiated program stand-up, facility upgrades, program office support, and other analysis support to include UAI, Mission Planning, Test Planning and Range Infrastructure requirements, and future test and integration on the F-35.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver SiAW weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, 0605898F and 0605833F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force</i> / BA 5: <i>System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0207328F / <i>Stand In Attack Weapon</i> |
|--|---|

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 3.400 | 43.175 | 87.840 | 0.000 | 87.840 |
| Current President's Budget | 3.288 | 14.975 | 162.840 | 0.000 | 162.840 |
| Total Adjustments | -0.112 | -28.200 | 75.000 | 0.000 | 75.000 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | -28.200 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -0.112 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 75.000 | 0.000 | 75.000 |

Change Summary Explanation

FY2018, \$0.112M Reduction for SBIR

FY2019, Congressional Reduction of \$28.2M

FY2020, increase of \$75.0M to improve lethality, responsiveness of weapon, acquire Air Force target sets sooner and personnel test facilities on the water and land ranges to support more accurate test design and conduct.

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| Title: Warhead and Fuze Development | 0.000 | 6.200 | 14.800 |
| Description: Develop and test warhead and fuze for SiAW and United States Navy (USN) Advanced Anti-Radiation Guided Missile-Extended Range (AARGM-ER). | | | |
| FY 2019 Plans: Start design efforts for the warhead and fuze for SiAW under the USN AARGM-ER contract. | | | |
| FY 2020 Plans: Continue working with the USN AARGM-ER Program office for further development and qualification. | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: Increase is due to FY20 being a full year of warhead/fuze development and ramping up for prototypes and testing. | | | |
| Title: Universal Armament Interface (UAI) / Anti-Radiation Homing message (ARH) | 0.000 | 0.500 | 10.500 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | | R-1 Program Element (Number/Name) PE 0207328F / <i>Stand In Attack Weapon</i> | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| <p>Description: Development and Test of an UAI ARH message set for the SiAW/AARGM-ER missile.</p> <p>FY 2019 Plans: Start design efforts for UAI ARH message set.</p> <p>FY 2020 Plans: Continue design and early validation of the UAI message set.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Increase is due to FY20 being a full year of UAI ARH development.</p> | | | | |
| <p>Title: F-35 Integration</p> <p>Description: Integration of the SiAW missile into the F-35. Efforts for aircraft integration will address the F-35 aircraft software development, UAI F-35 message set, Mission Planning capability in Joint Mission Planning System (JMPS), engineering to support weapon bay integration, testing, and airworthiness certification for the missile carriage and employment efforts.</p> <p>FY 2019 Plans: Begin the characterization and designs required for F-35 weapons bay and data transfer integration. Begin design of the SiAW mission planning capability in JMPS.</p> <p>FY 2020 Plans: Continue F-35 weapons bay integration design work. Continue development of an Air Force mission planning system involving the development of the JMPS unique planning component which maximizes SiAW capability for F-35 integration. Will also start Air Force UAI Development on the F-35.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Increase is due to FY20 being the first full year of F-35 Integration and associated development efforts.</p> | | 0.000 | 1.000 | 28.445 |
| <p>Title: Lethality, Responsiveness, Enhancements and Survivability (LRES)</p> <p>Description: Modeling, simulation and design of factors that augment weapons' lethality, flight responsiveness and survivability through software and hardware enhancements. Development of target sets and threat scenarios for testing.</p> <p>FY 2019 Plans: Continuing with Modeling & simulation to determine effective characteristics to meet the target set requirements.</p> <p>FY 2020 Plans:</p> | | 1.015 | 2.185 | 64.145 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | | R-1 Program Element (Number/Name) PE 0207328F / <i>Stand In Attack Weapon</i> | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| Continue and increase into the development and design of the Warhead/Fuze, UAI/ARH Message Set; Mission Planning; F-35 integration. Continue modeling and simulation and begin design on key attributes needed to meet desired outcomes for software and hardware enhancements. FY 2019 to FY 2020 Increase/Decrease Statement: Increase is due to FY20 being a full year design work for modeling, software, and hardware enhancements. | | | | |
| Title: SiAW Targets and Test Support Description: Government Test Support for F-35 Integration and Warhead/Fuze. Includes flight test equipment, construction and buying target sets to meet mission requirement; test wing and range support to include both sea and land range support, and other ground/flight test support that are specific to the Air Force target set requirements. FY 2019 Plans: Initial startup costs with 96TW to begin flight test support to include test equipment, & constructions of targets, and range support. FY 2020 Plans: Continue test support to include test equipment, & constructions of targets, range support, and other ground test support. This also includes modification to ranges including sea and land for longer range (straight shot capability). FY 2019 to FY 2020 Increase/Decrease Statement: Increase due to first full year of development, testing and design review. The AF will purchase Target Sets to include Sea and Land test range infrastructure upgrades. | | 0.000 | 1.000 | 10.750 |
| Title: SiAW Program Integration Description: Start up to include facilities, personnel, equipment plus other requirements to stand-up program office. FY 2019 Plans: Begin planning and project management of initial stand-up of program office. FY 2020 Plans: Continue planning, project management and initial procurement of equipment & facility updates to support program office personnel. FY 2019 to FY 2020 Increase/Decrease Statement: SiAW program integration increase due to one-time cost for increasing program office footprint/seating via relocatable, temporary equipment to support workforce, and office stand-up. | | 2.273 | 4.090 | 34.200 |
| Accomplishments/Planned Programs Subtotals | | 3.288 | 14.975 | 162.840 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0207328F / <i>Stand In Attack Weapon</i> |
|---|---|

D. Other Program Funding Summary (\$ in Millions)

| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> <u>Base</u> | <u>FY 2020</u> <u>OCO</u> | <u>FY 2020</u> <u>Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To</u> <u>Complete</u> | <u>Total Cost</u> |
|---|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|
| • RDTE 07 0205601N: <i>Harm Improvements</i> | 49.221 | 99.240 | 119.649 | - | 119.649 | 49.605 | 34.825 | 42.249 | 48.225 | 0.000 | 443.014 |

Remarks
Other Program funds - US Navy AARGM-ER Program Office: HARM Improvements /Operations Systems Development US Navy appropriation RDT&E 1319

E. Acquisition Strategy

The Stand-in-Attack (SiAW) program acquisition strategy will leverage the Navy's Advanced Anti-Radiation Guided Missile - Extended Range (AARGM-ER) program with the Air Force integrating onto the F-35 platform.

In partnership with the AARGM-ER program, SiAW will enter the EMD phase of the acquisition cycle and focus on detailed design, test, integrations, and production activities of SiAW. The Department of Navy (DoN) will be the lead for development and the United States Air Force (USAF) will be the lead for F-35 Integration. The relationship between the DoN and USAF will be defined in three separate Memorandums of Agreement (MOA): Requirements MOA, Program Office MOA, and Service Acquisition Executive MOA.

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0207328F / <i>Stand In Attack Weapon</i> | Project (Number/Name) 653133 / <i>Stand In Attack Weapon</i> |
|--|---|--|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Warhead & Fuze Development | Various | Various : Pax River, MD | - | 0.000 | | 6.200 | Mar 2019 | 14.800 | Dec 2019 | - | | 14.800 | Continuing | Continuing | - |
| Universal Armament Interface (UAI) Anti-Radiation Homing message (ARH) & Mission Planning (MP) | Various | Various : Pax River, MD | - | 0.000 | | 0.500 | Jul 2019 | 10.500 | Dec 2019 | - | | 10.500 | Continuing | Continuing | - |
| F-35 Integration | Various | Various : Various | - | 0.000 | | 1.000 | Jul 2019 | 28.445 | Dec 2019 | - | | 28.445 | Continuing | Continuing | - |
| Lethality, Responsiveness, Enhancements and Survivability | Various | Various : Various | - | 1.015 | Sep 2018 | 2.185 | Feb 2019 | 64.145 | Nov 2019 | - | | 64.145 | Continuing | Continuing | - |
| Subtotal | | | - | 1.015 | | 9.885 | | 117.890 | | - | | 117.890 | Continuing | Continuing | N/A |

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Government Test Support, includes flight test equipment, targets, 96TW and range support and SEEK Eagle support | Various | Not specified : TBD | - | - | | 1.000 | | 10.750 | | - | | 10.750 | Continuing | Continuing | - |
| Subtotal | | | - | - | | 1.000 | | 10.750 | | - | | 10.750 | Continuing | Continuing | N/A |

Remarks
Increase due to facilitation projects on the water and land ranges to allow more accurate testing of Air Force SiAW will also purchase/build up of the appropriate Air Force Target sets.

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Program Management Administration (PMA) | TBD | Various : Eglin AFB, FL | - | 2.273 | Sep 2018 | 4.090 | | 34.200 | | - | | 34.200 | Continuing | Continuing | - |

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0207328F / <i>Stand In Attack Weapon</i> | Project (Number/Name) 653133 / <i>Stand In Attack Weapon</i> |
|--|---|--|

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Provides program office oversight of development and upgrade activities to include planning and project management and personnel facilities. | | | | | | | | | | | | | | | |
| Subtotal | | | - | 2.273 | | 4.090 | | 34.200 | | - | | 34.200 | Continuing | Continuing | N/A |

Remarks
Management Services increase due to purchasing of modular equipment for facilitation of personnel and other equipment. Includes: Facilities, Civilian Pay, SBIR and travel.

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|
| Project Cost Totals | - | 3.288 | 14.975 | 162.840 | - | 162.840 | Continuing | Continuing | N/A |

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force **Date:** February 2019

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|--|---|--|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0207328F / <i>Stand In Attack Weapon</i> | Project (Number/Name) 653133 / <i>Stand In Attack Weapon</i> |
|--|---|--|

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
|---|--|
| Warhead & Fuze Development | |
| Design warhead & fuze | |
| UAI / ARH Message | |
| Design, test and validate UAI / ARH message | |
| F-35 Integration | |
| S&E Integration Risk Reduction | |
| LRES | |
| Modeling & Simulation to determine characteristics of target set requirements | |
| SiAW Targets and Test Support | |
| Flight test support and range modifications | |
| SiAW Program Integration | |
| Material Solution Analysis: Analysis of Alternatives (AoA) | |
| Acquisition Strategy | |
| USN AARGM-ER/AF SiAW Requirements MOA | |
| USN AARGM-ER/AF SiAW Program Office MOA | |
| USN/AF SAE MOA | |
| Technology Maturation and Risk Reduction (TMRR) | |
| Engineering and Manufacturing Development (EMD) | |

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0207328F / <i>Stand In Attack Weapon</i> | Project (Number/Name) 653133 / <i>Stand In Attack Weapon</i> |
|--|---|--|

Schedule Details

| Events by Sub Project | Start | | End | |
|---|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| Warhead & Fuze Development | | | | |
| Design warhead & fuze | 3 | 2019 | 4 | 2023 |
| UAI / ARH Message | | | | |
| Design, test and validate UAI / ARH message | 3 | 2019 | 4 | 2023 |
| F-35 Integration | | | | |
| S&E Integration Risk Reduction | 4 | 2019 | 4 | 2024 |
| LRES | | | | |
| Modeling & Simulation to determine characteristics of target set requirements | 4 | 2019 | 4 | 2023 |
| SiAW Targets and Test Support | | | | |
| Flight test support and range modifications | 4 | 2019 | 1 | 2022 |
| SiAW Program Integration | | | | |
| Matériel Solution Analysis: Analysis of Alternatives (AoA) | 1 | 2018 | 3 | 2019 |
| Acquisition Strategy | 4 | 2018 | 3 | 2019 |
| USN AARGM-ER/AF SiAW Requirements MOA | 4 | 2018 | 2 | 2019 |
| USN AARGM-ER/AF SiAW Program Office MOA | 4 | 2018 | 2 | 2019 |
| USN/AF SAE MOA | 4 | 2018 | 3 | 2019 |
| Technology Maturation and Risk Reduction (TMRR) | 1 | 2018 | 3 | 2023 |
| Engineering and Manufacturing Development (EMD) | 2 | 2019 | 4 | 2023 |

Note

USAF will follow AARGM-ER's Acquisition Milestone Schedule. FY20 includes KP 3 Milestone and Critical Design Review (CDR).

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0207701F / <i>Full Combat Mission Training</i> |
|---|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 8.427 | 1.015 | 9.797 | 0.000 | 9.797 | 9.846 | 7.010 | 7.138 | 7.266 | Continuing | Continuing |
| 655012: <i>Full Combat Mission Training</i> | - | 0.000 | 1.015 | 9.797 | 0.000 | 9.797 | 9.846 | 7.010 | 7.138 | 7.266 | Continuing | Continuing |
| 655354: <i>F-16 Block 40/50 MTC</i> | - | 8.427 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 8.427 |

A. Mission Description and Budget Item Justification

Full Combat Mission Training (FCMT) supports Air Force Distributed Mission Operations (DMO) and Live-Virtual-Constructive (LVC) integration. DMO is an operational readiness initiative enabling the USAF to exercise and train at the operational and strategic levels of war while facilitating unit-level training. FCMT funding provides research in areas benefiting the AF DMO/LVC environment as a whole. Provides research and development to facilitate integration of fielded and newly acquired, Air Force owned training devices into DMO/LVC networks. Enhances the quality of training for the systems added to the network. Enables aircrews to network with LVC components to form the integrated DMO battlespace. Links geographically distributed high-fidelity combat and combat support training devices including Command and Control and Intelligence, Surveillance, and Reconnaissance systems. Develops, demonstrates and inserts multi-level security capability. This capability allows the warfighters at home station to exercise and train at the operational and strategic levels of war as well as conduct networked unit-level training.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver Full Combat Mission Training capabilities. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, 0605898F, and 0605833F.

In FY 2019, PE 0207701F, Full Combat Mission Training, Project 655354, F-16 Block (Blk) 40/50 Mission Training Center (MTC) efforts were transferred to PE 0207133F, F-16, Project 672671, F-16 Blk 40/50 MTC, in order to transfer programmatic responsibilities and funding to the F-16 weapon system team.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0207701F / <i>Full Combat Mission Training</i> |
|---|---|

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 16.727 | 1.015 | 9.797 | 0.000 | 9.797 |
| Current President's Budget | 8.427 | 1.015 | 9.797 | 0.000 | 9.797 |
| Total Adjustments | -8.300 | 0.000 | 0.000 | 0.000 | 0.000 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | -8.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -0.300 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Change Summary Explanation

FY18:

- \$8.000M for forward financing
- \$0.300M for SBIR Transfer

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|---|--------------------|----------------|----------------|---------------------|--|----------------------|----------------|----------------|---|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 5 | | | | | R-1 Program Element (Number/Name) PE 0207701F / Full Combat Mission Training | | | | Project (Number/Name) 655012 / Full Combat Mission Training | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 655012: Full Combat Mission Training | - | 0.000 | 1.015 | 9.797 | 0.000 | 9.797 | 9.846 | 7.010 | 7.138 | 7.266 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

Full Combat Mission Training (FCMT) supports Air Force Distributed Mission Operations (DMO) and Live-Virtual-Constructive (LVC) integration. DMO is an operational readiness initiative enabling the USAF to exercise and train at the operational and strategic levels of war while facilitating unit-level training. FCMT funding provides research in areas benefiting the AF DMO/LVC environment as a whole. Provides research and development to facilitate integration of fielded and newly acquired, Air Force owned training devices into DMO/LVC networks. Enhances the quality of training for the systems added to the network. Enables aircrews to network with LVC components to form the integrated DMO battlespace. Links geographically distributed high-fidelity combat and combat support training devices including Command and Control and Intelligence, Surveillance, and Reconnaissance systems. Develops, demonstrates and inserts multi-level security capability. This capability allows the warfighters at home station to exercise and train at the operational and strategic levels of war as well as conduct networked unit-level training.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| Title: FCMT Cross Domain Solutions (CDS) | 0.000 | 0.286 | 1.714 |
| Description: Development, demonstration, and insertion of multi-level security (MLS) capability. | | | |
| FY 2019 Plans: | | | |
| - Continue accreditation for coalition rule sets | | | |
| - Complete fourth to fifth generation MLS rule development for routine Live, Virtual and Constructive (LVC) environment integration | | | |
| - Develop updates for cross domain rule sets | | | |
| FY 2020 Plans: | | | |
| - Continue accreditation for coalition rule sets | | | |
| - Continue fourth to fifth generation MLS rule development for routine LVC environment integration | | | |
| - Develop updates for cross domain rule sets | | | |
| - Validate CDS at upgraded classification/program levels with local Air Force Research Laboratory space boundary | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: | | | |
| FY 2020 increase due to advancements in integrating CDS rule sets into 4th Gen LVC demonstration. Further risk mitigation work required for 5th Gen integration and classification levels. | | | |
| Title: FCMT Develop DMO Capabilities | 0.000 | 0.223 | 4.594 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0207701F / Full Combat Mission Training | Project (Number/Name) 655012 / Full Combat Mission Training | | |
| B. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| <p>Description: Development, demonstrations, studies and insertions of DMO/LVC related technologies and proficiency based continuation training strategies.</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none"> - Complete validation of training environment credibility assessments for an identified set of ACC Virtual and Constructive environments. - Continue to develop metrics and tools to measure training proficiency gained during LVC events - Conclude demonstration of persistent performance measurement and readiness assessment in fourth to fifth LVC training events. <p>FY 2020 Plans:</p> <ul style="list-style-type: none"> - Continue validation and accreditation of integrated scenarios and syllabi across DMO environments at a high fidelity to demonstrate persistent performance measurement and readiness assessment in 4th to 5th generation LVC events, and evaluate integration of different data management and tracking methods to support large scale, secure and persistent Joint and Coalition LVC events - Validate MTC code upgrades in testbeds with operators - Bring advanced research training testbeds up to higher classification levels to commence full on fighter integration (F-16, F-22, and F-35) and accomplish accreditations at higher classification and program levels - Develop joint and collation data standards and evaluate data management methods to support LVC events <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 increase to further develop validation and accreditation of integrated scenarios and syllabi across DMO environments and validate MTC code upgrades in research testbeds.</p> | | | | |
| <p>Title: FCMT Validation of warfighter seasoning and development of objective performance enhancements</p> <p>Description: Studies to assess and validate warfighter seasoning in continuation training and accreditation of portions of this process; studies to develop objective enhancement and measurement tools for the DMO/LVC environment.</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none"> - Continue research and development for the integration of F-35, Joint and Coalition Trainers into the Combat Air Forces (CAF) Distributed Mission Operations (DMO) network - Develop common Joint and Coalition data standards for secure, interoperable training at joint and coalition levels of analysis - Conclude evaluation of the integration of different data management and tracking methods to support large scale, secure and persistent Joint and Coalition LVC events | | 0.000 | 0.253 | 2.104 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0207701F / Full Combat Mission Training | Project (Number/Name) 655012 / Full Combat Mission Training | | |
| B. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| <p>- Begin demonstrations of persistent performance measurement and readiness assessment in fourth to fifth generation LVC events</p> <p>FY 2020 Plans:</p> <ul style="list-style-type: none"> - Continue research and development for the integration of F-35, Joint and Coalition Trainers into the CAF DMO network - Continue interoperability studies to evaluate the training value of fifth generation interoperable coalition training on the CAF DMO network - Continue the validation of rule sets for the LVC environment and evaluate network architectures and typologies for distributed secure LVC events out across joint and coalition players - Continue to develop metrics and tools to measure training proficiency gained during LVC events <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 increase will further refine and development integration standards for 5th Gen, joint service, and coalition Trainers into the CAF DMO network</p> | | | | |
| <p>Title: FCMT Other Network Studies</p> <p>Description: Research and development to provide for the integration of fielded and newly introduced, Air Force, Joint and Coalition high-fidelity flight and mission trainers.</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none"> - Continue research and development for the integration of F-35, Joint and Coalition Trainers into the CAF DMO network - Continue interoperability studies to evaluate the training value of fifth generation interoperable coalition training on the CAF DMO network - Develop common Joint and Coalition data standards for secure, interoperable training at joint and coalition levels of analysis - Conclude evaluation of the integration of different data management and tracking methods to support large scale, secure and persistent Joint and Coalition live, virtual, constructive events - Begin demonstrations of persistent performance measurement and readiness assessment in fourth to fifth generation LVC events - Develop gateways and CDS to integrate high-fidelity trainers with Air Force, joint, and coalition networks <p>FY 2020 Plans:</p> <ul style="list-style-type: none"> - Demonstrate integration of F-35, Joint and Coalition Trainers into the CAF DMO network - Conclude interoperability studies to evaluate the training value of fifth generation interoperable coalition training on the CAF DMO network - Continue development of common Joint and Coalition data standards for secure, interoperable training at joint and coalition levels of analysis | | 0.000 | 0.253 | 1.385 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0207701F / Full Combat Mission Training | Project (Number/Name) 655012 / Full Combat Mission Training |
|--|--|---|

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|---------|---------|---------|
| <ul style="list-style-type: none"> - Continue demonstrations of persistent performance measurement and readiness assessment in fourth to fifth generation LVC events - Continue development of gateways and CDS to integrate high-fidelity trainers with Air Force, joint, and coalition networks <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> FY 2020 increase will further research and development in conducting interoperability studies for 5th gen systems, develop secure data standards, and integrate the F-35, joint, and coalition partners into the DMO network.</p> | | | |
| Accomplishments/Planned Programs Subtotals | 0.000 | 1.015 | 9.797 |

C. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

D. Acquisition Strategy

Each platform joining the DMO/LVC environment selects its own acquisition strategy based on Using Command needs, Economic Analysis, and the magnitude of the training system changes required to provide DMO capability. The initial systems in the DMO/LVC environment; F-15C/E, Airborne Warning and Control System, and F-16 Block 40/50, all required new training systems. Additionally, the Operations and Integration capability was created. The Training Simulation Service (TSS) acquisition strategy was used to meet a portion of these requirements. In the TSS approach, the contractor owns and provides the simulator equipment, maintains simulator concurrency with weapon systems, and has incentives to keep the equipment up to date with simulator and network technologies. Currently fielded and projected Air Force-owned Flight and Mission Training Systems without DMO/LVC capability will be modified using FCMT funds to ensure compatibility with the DMO/LVC environment. To accomplish this, the Air Force Research Laboratory will conduct research/studies to Develop/implement CDS, develop DMO capabilities, validate warfighter seasoning, develop objective performance enhancements, and conduct other network studies.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0207701F / Full Combat Mission Training | Project (Number/Name) 655012 / Full Combat Mission Training |
|--|--|---|

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| FCMT Cross Domain Solutions (CDS): Development, Testing and insertion of Multi-level-security protocols, Cross Domain rule set development and accreditation | Various | Air Force Research Lab, 711 Human Performance Wing, Human : Dayton, OH | - | 0.000 | Jan 2018 | 0.285 | Jan 2019 | 1.714 | Jan 2020 | - | | 1.714 | Continuing | Continuing | - |
| FCMT Develop DMO Capabilities: demonstration, studies and insertion of distributed mission ops related technologies and proficiency based continuation training | Various | Air Force Research Lab, 711 Human Performance Wing : Dayton, OH | - | 0.000 | Jan 2018 | 0.223 | Jan 2019 | 4.594 | Jan 2020 | - | | 4.594 | Continuing | Continuing | - |
| FCMT Validation of warfighter seasoning and development of objective performance enhancements for DMO/ LVC environment | Various | Air Force Research Lab, 711 Human Performance Wing : Dayton, OH | - | 0.000 | Jan 2018 | 0.254 | Jan 2019 | 2.104 | Jan 2020 | - | | 2.104 | Continuing | Continuing | - |
| FCMT Other Network Studies: Research and Development to support integration of newly fielded high-fidelity training systems and networks | Various | Air Force Research Lab, 711 Human Performance Wing : Dayton, OH | - | 0.000 | Jan 2018 | 0.253 | Jan 2019 | 1.385 | Jan 2020 | - | | 1.385 | Continuing | Continuing | - |
| Subtotal | | | - | 0.000 | | 1.015 | | 9.797 | | - | | 9.797 | Continuing | Continuing | N/A |

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|
| Project Cost Totals | - | 0.000 | 1.015 | 9.797 | - | 9.797 | Continuing | Continuing | N/A |

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|---|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0207701F / Full Combat Mission Training | Project (Number/Name) 655012 / Full Combat Mission Training |
|--|--|---|

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|--|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| Full Combat Mission Training | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Develop Multi-Level Security testbed and support testing on 5th Gen systems | █ | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Develop 4th to 5th generation rule sets for coalition integration | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | |
| Evaluate and assess commercial and government off-the-shelf cross domain solution devices | █ | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Perform accreditation for cross domain solution rule sets | | | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | |
| Develop rule sets for routine LVC environment integration | | | | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | |
| Continue to develop CDS rule sets | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | |
| Integrate scenarios and syllabi across DMO environments | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | |
| Develop metrics for routine proficiency evaluations and determine standard format for storing/analyzing proficiency data | █ | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Create and evaluate alternative data formats for routinely tracking and storing performance and proficiency data | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | |
| Refine learning managed scenario and integrate with live, virtual, constructive events | | | | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | |
| Validate training environment credibility assessments for an identified set of Air Combat Command Virtual and Constructive Environments | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | |

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | Date: February 2019 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---------|---|---|---|--|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|--|--|--|--|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0207701F / Full Combat Mission Training | | | | | | | | Project (Number/Name) 655012 / Full Combat Mission Training | | | | | | | | | | | | | | | | | | | | | | | |
| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | | | | | |
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | | | | |
| Develop and integrate After Action Review tools for Mission Training Centers | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Develop metrics and tools to measure training proficiency gained during LVC events | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Integrate 5th generation systems into DMO network | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Conduct interoperability studies to evaluate the training value of fifth generation interoperable coalition training on the CAF DMO network | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Develop joint and coalition data standards and evaluate data management methods to support live, virtual, and constructive events | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Evaluation of the integration of different data management and tracking methods to support large scale, secure and persistent Joint and Coalition LVC events. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Demonstrate persistent performance measurement and readiness assessment in fourth to fifth generation LVC events | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Evaluate network architectures and typologies for distributed secure LVC events | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Develop gateways and cross domain solutions to integrate high-fidelity trainers with Air Force, joint, and coalition networks | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Evaluate compressed DIS network standards for CDS in DMO | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Integrate and evaluate multi-domain operations and kill-chain training scenarios for contested environments | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|---|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0207701F / Full Combat Mission Training | Project (Number/Name) 655012 / Full Combat Mission Training |
|--|--|---|

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---|------------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| Evaluate multi-national mission planning and debrief technologies in research training events | [REDACTED] | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Implement, evaluate, and field technologies aligned with future training strategies for LVC | [REDACTED] | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0207701F / <i>Full Combat Mission Training</i> | Project (Number/Name) 655012 / <i>Full Combat Mission Training</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|---|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| Full Combat Mission Training | | | | |
| Develop Multi-Level Security testbed and support testing on 5th Gen systems | 1 | 2018 | 4 | 2018 |
| Develop 4th to 5th generation rule sets for coalition integration | 1 | 2018 | 4 | 2020 |
| Evaluate and assess commercial and government off-the-shelf cross domain solution devices | 1 | 2018 | 2 | 2018 |
| Perform accreditation for cross domain solution rule sets | 3 | 2018 | 3 | 2021 |
| Develop rule sets for routine LVC environment integration | 4 | 2018 | 3 | 2021 |
| Continue to develop CDS rule sets | 1 | 2018 | 1 | 2020 |
| Integrate scenarios and syllabi across DMO environments | 1 | 2018 | 1 | 2019 |
| Develop metrics for routine proficiency evaluations and determine standard format for storing/analyzing proficiency data | 1 | 2018 | 2 | 2018 |
| Create and evaluate alternative data formats for routinely tracking and storing performance and proficiency data | 1 | 2018 | 1 | 2021 |
| Refine learning managed scenario and integrate with live, virtual, constructive events | 3 | 2018 | 4 | 2023 |
| Validate training environment credibility assessments for an identified set of Air Combat Command Virtual and Constructive Environments | 1 | 2018 | 1 | 2019 |
| Develop and integrate After Action Review tools for Mission Training Centers | 1 | 2018 | 4 | 2018 |
| Develop metrics and tools to measure training proficiency gained during LVC events | 3 | 2018 | 4 | 2022 |
| Integrate 5th generation systems into DMO network | 1 | 2018 | 3 | 2020 |
| Conduct interoperability studies to evaluate the training value of fifth generation interoperable coalition training on the CAF DMO network | 1 | 2018 | 3 | 2021 |
| Develop joint and coalition data standards and evaluate data management methods to support live, virtual, and constructive events | 1 | 2019 | 2 | 2023 |

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|---|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0207701F / Full Combat Mission Training | Project (Number/Name) 655012 / Full Combat Mission Training |
|--|--|---|

| Events by Sub Project | Start | | End | |
|---|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| Evaluation of the integration of different data management and tracking methods to support large scale, secure and persistent Joint and Coalition LVC events. | 2 | 2018 | 3 | 2020 |
| Demonstrate persistent performance measurement and readiness assessment in fourth to fifth generation LVC events | 4 | 2019 | 2 | 2024 |
| Evaluate network architectures and typologies for distributed secure LVC events | 1 | 2018 | 1 | 2020 |
| Develop gateways and cross domain solutions to integrate high-fidelity trainers with Air Force, joint, and coalition networks | 3 | 2019 | 4 | 2024 |
| Evaluate compressed DIS network standards for CDS in DMO | 3 | 2019 | 4 | 2024 |
| Integrate and evaluate multi-domain operations and kill-chain training scenarios for contested environments | 2 | 2020 | 4 | 2024 |
| Evaluate multi-national mission planning and debrief technologies in research training events | 2 | 2020 | 3 | 2023 |
| Implement, evaluate, and field technologies aligned with future training strategies for LVC | 3 | 2019 | 4 | 2024 |

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|---|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0207701F / Full Combat Mission Training | Project (Number/Name) 655354 / F-16 Block 40/50 MTC |
|--|--|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|------------------------------|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| 655354: F-16 Block 40/50 MTC | - | 8.427 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 8.427 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

F-16 Block 40/50 Mission Training Center (MTC) supports the development, acquisition, fielding and integration of high fidelity, DMO capable flight simulators for F-16 Block 40 and 50 weapon systems. Each MTC includes multiple high fidelity Simulator Cockpits, Instructor Operator Stations, a Threat Server and Brief/Debrief and Mission Observation capability. Each is capable of linking to geographically distributed high-fidelity combat and combat support training devices including Command and Control and Intelligence, Surveillance, and Reconnaissance systems. This capability allows the warfighters at home station to exercise and train at the operational and strategic levels of war as well as conduct networked unit-level training. Funds may be used to address emerging and short-notice Diminishing Manufacturing Sources(DMS) issues. DMS efforts to include removal of end-of-life software/hardware within simulators systems and move to a modular, common open system architecture that is sustainable and cyber-resilient. Implement requirements and standards defined under the Simulator Common Architecture Requirements and Standards initiative.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver Full Combat Mission Training capabilities. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, 0605898F, and 0605833F.

In FY 2019, PE 0207701F, Full Combat Mission Training, Project 655354, F-16 Blk 40/50 MTC efforts were transferred to PE 0207133F, F-16, Project 672671, F-16 Blk 40/50 MTC, in order to transfer programmatic responsibilities and funding to the F-16 weapon system team.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|--|---------|---------|---------|
| Title: F-16 MTC Modification Development | 8.427 | 0.000 | 0.000 |
| Description: Development and testing of modifications to the F-16 MTC to maintain concurrency with F-16 aircraft. | | | |
| FY 2019 Plans: N/A | | | |
| FY 2020 Plans: N/A | | | |
| Accomplishments/Planned Programs Subtotals | 8.427 | 0.000 | 0.000 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0207701F / Full Combat Mission Training | Project (Number/Name) 655354 / F-16 Block 40/50 MTC |

C. Other Program Funding Summary (\$ in Millions)

| Line Item | FY 2018 | FY 2019 | FY 2020 | FY 2020 | FY 2020 | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To | |
|--|---------|---------|---------|---------|---------|---------|---------|---------|---------|------------|------------|
| | | | Base | OCO | Total | | | | | Complete | Total Cost |
| • APAF 05 Line Item OTHACF: Other Aircraft | 9.876 | 0.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| • APAF 06 Line item 000999: Initial Spares/Repair Parts | 0.219 | 0.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.111 | 0.113 | Continuing | Continuing |

Remarks

In FY 2019, the APAF funds were transferred from Other Aircraft to PE 0207133F, F0160P, in order to transfer programmatic responsibilities and funding to the F-16 weapon system team.

D. Acquisition Strategy

F-16 Block 40/50 MTCs are being developed, fielded, and modified under a competitively awarded Federal Acquisition Regulation Part 15 Supply contract with RDT&E and APAF funds. The MTCs are sustained by Contract Logistic Support using Operations and Maintenance funds. Physical changes to the MTC cockpits required by any Operational Flight Program update will be funded in the F-16 APAF Mod Line.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|---|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0207701F / Full Combat Mission Training | Project (Number/Name) 655354 / F-16 Block 40/50 MTC |
|--|--|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| F-16 Blk 40/50 Mission Training Center (MTC) | C/Various | L3 Comm, Link Simulation & Training : Arlington, TX | - | 8.180 | Dec 2017 | - | | 0.000 | | - | | 0.000 | Continuing | Continuing | - |
| Subtotal | | | - | 8.180 | | - | | 0.000 | | - | | 0.000 | Continuing | Continuing | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| F-16 Blk 40/50 Mission Training Center (MTC) Program Management Administration- Over Gov't Costs | C/FFP | AFLCMC/WNS AFMC : Dayton, OH | - | 0.247 | Dec 2017 | - | | - | | - | | - | Continuing | Continuing | - |
| Subtotal | | | - | 0.247 | | - | | - | | - | | - | Continuing | Continuing | N/A |

| Project Cost Totals | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|--------------------|----------------|----------------|---------------------|--------------------|----------------------|-------------------------|-------------------|---------------------------------|
| - | - | 8.427 | 0.000 | 0.000 | - | 0.000 | Continuing | Continuing | N/A |

Remarks

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0207701F / Full Combat Mission Training | Project (Number/Name) 655354 / F-16 Block 40/50 MTC |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|--|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| F-16 BLK 40/50 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OFF M7.1+ | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OFF M7.2+ | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0207701F / <i>Full Combat Mission Training</i> | Project (Number/Name) 655354 / <i>F-16 Block 40/50 MTC</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|------------------------------|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>F-16 BLK 40/50</i> | | | | |
| OFP M7.1+ | 1 | 2018 | 3 | 2018 |
| OFP M7.2+ | 2 | 2018 | 4 | 2018 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0303267F / <i>Auctioned Spectrum Relocation Fund</i> |
|---|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 60.546 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 60.546 |
| 658062: <i>Auctioned Spectrum Relocation Fund</i> | - | 60.546 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 60.546 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

Funding supports Spectrum relocation and sharing activities.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

| <u>B. Program Change Summary (\$ in Millions)</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020 Base</u> | <u>FY 2020 OCO</u> | <u>FY 2020 Total</u> |
|--|-----------------------|-----------------------|----------------------------|---------------------------|-----------------------------|
| Previous President's Budget | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Current President's Budget | 60.546 | 0.000 | 0.000 | 0.000 | 0.000 |
| Total Adjustments | 60.546 | 0.000 | 0.000 | 0.000 | 0.000 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | 60.546 | 0.000 | 0.000 | 0.000 | 0.000 |

Change Summary Explanation

Receive funds during execution year through a transfer from OMB

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0303267F / <i>Auctioned Spectrum Relocation Fund</i> |
|---|---|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| Title: Auctioned Spectrum Relocation Fund | 60.546 | 0.000 | 0.000 |
| Description: Funding supports Spectrum relocation and sharing activities | | | |
| FY 2019 Plans: N/A | | | |
| FY 2020 Plans: N/A | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: Funding supports Spectrum relocation and sharing activities. | | | |
| Accomplishments/Planned Programs Subtotals | 60.546 | 0.000 | 0.000 |

D. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

E. Acquisition Strategy

Funding supports Spectrum relocation and sharing activities.

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|--|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0303267F / <i>Auctioned Spectrum Relocation Fund</i> | Project (Number/Name) 658062 / <i>Auctioned Spectrum Relocation Fund</i> |
|--|---|--|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Support spectrum relocation and sharing activities | TBD | Various : TBD | - | 60.546 | | - | | - | | - | | - | Continuing | Continuing | - |
| Subtotal | | | - | 60.546 | | - | | - | | - | | - | Continuing | Continuing | N/A |

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|---------------------------------|
| Project Cost Totals | | | - | 60.546 | 0.000 | - | - | - | Continuing Continuing N/A |

Remarks

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0303267F / <i>Auctioned Spectrum Relocation Fund</i> | Project (Number/Name) 658062 / <i>Auctioned Spectrum Relocation Fund</i> |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|--|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
|--|--|
| <i>Auctioned Spectrum Relocation Fund</i> | |
| Support spectrum relocation activities | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0303267F / <i>Auctioned Spectrum Relocation Fund</i> | Project (Number/Name) 658062 / <i>Auctioned Spectrum Relocation Fund</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Auctioned Spectrum Relocation Fund</i> | | | | |
| Support spectrum relocation activities | 1 | 2018 | 4 | 2018 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0307581F / <i>JSTARS Recap</i> |
|---|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|--|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | 278.180 | 390.713 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 668.893 |
| 650003: <i>JSTARS Recapitalization</i> | 278.180 | 390.713 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 668.893 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | - | - |

Program MDAP/MAIS Code: 513

Note

FY17 funding reduced by reprogramming. Program not continued in FY19 PB. FY19 NDAA added funding to continue GMTI radar development only. FY19 SAC-D mark \$383.4M of FY18 funding.

A. Mission Description and Budget Item Justification

The Joint Surveillance Target Attack Radar System Recapitalization (JSTARS Recap) weapon system will replace the currently fielded E-8C Joint STARS weapon system and will execute in both global and regional conflicts in support of operations ranging from peacetime engagements to conventional, high intensity, general warfare. JSTARS Recap will provide airborne, stand-off range, surveillance and target acquisition radar and Battle Management Command and Control (BMC2) capabilities. JSTARS Recap will provide theater, ground and air commanders with ground surveillance to support attack operations and targeting that contributes to the delay, disruption, and destruction of enemy forces.

FY18 to FY23 RDT&E BA required to execute the Engineering Manufacturing and Development (EMD) phase of this acquisition. The focus of EMD will be to procure three Commercial Derivative Aircraft (CDA) and integrate the various subsystems (i.e. BMC2, Communications, Radar and ground support systems) to verify that system performance meets required capabilities. The primary evaluation of the weapon system development will occur during the EMD phase. Additionally, there will be major Technical Reviews accomplished during this phase: Combined System Requirements Review/System Functional Review (SRFR); Preliminary Design Review (PDR); Critical Design Review (CDR); Test Readiness Reviews (TRR); Production Readiness Review (PRR), Functional Configuration Audit (FCA) and Physical Configuration Audit (PCA).

Funding may also support studies, analyses, and risk reduction activities addressing all subsystems to support both current program planning/execution and future Air Force program planning.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver JSTARS Recap weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, and 0605898F.

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| | |
|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0307581F / <i>JSTARS Recap</i> |
|---|---|

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 417.201 | 0.000 | 0.000 | 0.000 | 0.000 |
| Current President's Budget | 390.713 | 0.000 | 0.000 | 0.000 | 0.000 |
| Total Adjustments | -26.488 | 0.000 | 0.000 | 0.000 | 0.000 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | -13.132 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -13.356 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Change Summary Explanation

Program not continued in the FY19 PB. FY19 funding added by NDAA to \$30M for continued GMTI radar development. FY18 funding marked through SAC-D of \$383.4M.

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| Title: Technology Maturation and Risk Reduction (TMRR) | 0.000 | 0.000 | 0.000 |
| Description: JSTARS Recap TMRR Contract activities leveraged DoD prior investments and Industrys Independent Research and Development (IR&D) investments to conduct technical reviews and subsystem prototype demonstrations. TMRR activities assessed industry's system-level design readiness /maturity with respect to top integration risks and use of Open Systems Architecture (OSA) and Open Mission System (OMS) standards. The TMRR contract activities informed the Government about the integration complexity and associated lifecycle risks involved with different system-level design solutions, including radar risk reduction. Activities also include studies, analyses, and risk reduction addressing all subsystems to support current program planning /execution and future program planning. These activities informed the Engineering, Manufacturing and Development with Production, Request for Proposal released 26 Dec 16. | | | |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | | R-1 Program Element (Number/Name) PE 0307581F / <i>JSTARS Recap</i> | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| <p>FY 2019 Plans: The program will perform Radar subsystem risk reduction activities, studies and analysis, hardware and software prototyping, and technical demonstrations. These activities will mature the radar design and manufacturing process, as well as demonstrate key MTI and SAR capabilities.</p> <p>FY 2020 Plans: N/A</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: N/A</p> | | | | |
| <p>Title: Engineering Manufacturing Development (EMD)</p> <p>Description: The focus of EMD will be to procure three Commercial Derivative Aircraft (CDA) and integrate the various subsystems (i.e. BMC2, Communications, Radar and ground support systems) to verify that system performance meets required capabilities. Testing will occur throughout EMD using both contractor and Government provided data through various methods that include testing in System Integration Labs (SIL), ground testing, and flight testing. Major Technical Reviews will be accomplished during EMD: Combined System Requirements Review/System Functional Review (SRFR); Preliminary Design Review (PDR); Critical Design Review (CDR); Test Readiness Reviews; Production Readiness Review (PRR), Functional Configuration Audit (FCA) and Physical Configuration Audit (PCA).</p> <p>FY 2019 Plans: - Conduct System Requirements Review / System Functional Review (SRR / SFR) - Conduct Preliminary and Critical Design Reviews - Procure BMC2 and Communications Mission Systems and associated Group A hardware after CDR - Begin DT&E</p> <p>FY 2020 Plans: N/A</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: N/A</p> | | 390.713 | 0.000 | 0.000 |
| Accomplishments/Planned Programs Subtotals | | 390.713 | 0.000 | 0.000 |
| D. Other Program Funding Summary (\$ in Millions) | | | | |
| N/A | | | | |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force Date: February 2019

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|--|--|
| Appropriation/Budget Activity 3600: Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD) | R-1 Program Element (Number/Name) PE 0307581F I JSTARS Recap |
|--|--|

D. Other Program Funding Summary (\$ in Millions)

Remarks

Program not continued in FY19 PB. FY19 NDAA added funding to continue GMTI radar development only. FY19 SAC-D mark rescinds \$383.4M of FY18.

E. Acquisition Strategy

The JSTARS Recap program (hereinafter, the "Program") is a pre-Major Defense Acquisition Program (MDAP). The Program achieved Milestone (MS) A approval on 10 December 2015, received Request for Proposal (RFP) release decision review Acquisition Decision Memorandum (ADM) on 7 September 2016, and commenced source selection on 2 March 2017. The MS B decision review is currently scheduled for 2QFY18, with a contract award anticipated 3-4QFY18. JSTARS Recap is comprised of a business-class CDA with integrated BMC2, radar and communication subsystems, as well as ground support systems (trainers, simulators, mission planning, etc). The Program will leverage available systems and mature technologies using Open Systems Architecture (OSA) to minimize risks during the EMD phase while lowering life cycle costs. The Program developed a Government Reference Architecture (GRA) to define functional capabilities of the JSTARS Recap Weapon System (WS). The GRA enabled subsystem technical analysis and risk reduction to validate technical maturity. The GRA also supports the Program's strategy to OTB, aimed to reduce cost throughout the system's life cycle, foster competition during the Operations and Support (O&S) acquisition phase, and allow flexibility to readily incorporate new technologies and capabilities.

Prior to MS A, the Program executed three (3) contracts to conduct system-level System Requirements Reviews (SRR) (collectively, the "Pre-EMD Contracts"). The Pre-EMD Contracts focused on requirements analysis, assessing the WS design, design maturity, and risk reduction. Upon receiving MS A approval, the Program exercised the TMRR options for system-level design reviews and subsystems prototype demonstrations. In parallel with the Pre-EMD Contracts, the Program also executed contracts with the two (2) viable radar Original Equipment Manufacturers (OEMs) focused on advancing radar design, assessing manufacturing readiness, and mitigating both technical and schedule risk during the EMD Phase. The Program commenced source selection on 2 March 2017. This was separate, full and open competition for the EMD phase of the Program. Contract Award is expected between 2-4QFY18 and will include the EMD effort as well as options for Low-Rate Initial Production (LRIP) and FRP Lots #1-3.

The Program will develop a total of seventeen (17) JSTARS Recap WS. The first three (3) WS produced during EMD will be instrumented to support Developmental Test and Evaluation (DT&E). After DT&E, two (2) of these instrumented WS will be reconfigured to production representative WS in support of Initial Operational Capability (IOC); the one (1) remaining WS will maintain instrumentation for testing purposes. Two (2) LRIP WS will be developed to meet the four (4) WS required for IOC. FRP will consist of three (3) production lots to procure an additional twelve (12) WS to support Full Operational Capability (FOC) by 2QFY28.

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0307581F / JSTARS Recap | Project (Number/Name) 650003 / JSTARS Recapitalization |
|--|--|--|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| JSTARS Recap Pre-EMD Contract #1 | C/FFP | Boeing Service Co. : Richardson, TX | 37.380 | - | | - | | - | | - | | - | 0.000 | 37.380 | 27.380 |
| JSTARS Recap Pre-EMD Contract #2 | C/FFP | Northrop Grumman Systems Corp : Melbourne, FL | 24.750 | - | | - | | - | | - | | - | 0.000 | 24.750 | 24.750 |
| JSTARS Recap Pre-EMD Contract #3 | C/FFP | Lockheed Martin Corp : King of Prussia, PA | 24.723 | - | | - | | - | | - | | - | 0.000 | 24.723 | 24.723 |
| JSTARS Recap Radar Risk Reduction Contract #1 | C/CPFF | Raytheon : McKinney, TX | 38.820 | - | | - | | - | | - | | - | 0.000 | 38.820 | 60.465 |
| JSTARS Recap Radar Risk Reduction Contract #2 | C/CPFF | Northrop Grumman Systems Corp : Linthicum Heights, MD | 54.569 | - | | - | | - | | - | | - | 0.000 | 54.569 | 63.408 |
| JSTARS Recap EMD | Various | TBD : TBD | 0.000 | 358.862 | Sep 2018 | - | | - | | - | | - | 0.000 | 358.862 | 373.600 |
| Subtotal | | | 180.242 | 358.862 | | - | | - | | - | | - | 0.000 | 539.104 | N/A |

Remarks
EMD contract award assumption is last half of FY18 (3QFY18 used for budgetary purposes). Pre-Engineering and Manufacturing Development (EMD) contracts were incrementally funded with the basic contract (Materiel Solution Analysis) awarded on 7 August 2015 and options for Technology Maturation and Risk Reduction (TMRR) activities exercised in FY16. Two Radar Risk Reduction contracts were awarded in FY16 with follow-on efforts in FY17.

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Responsible Test Organization (RTO) | MIPR | Various : Various | 3.537 | 5.251 | Oct 2017 | - | | - | | - | | - | 0.000 | 8.788 | 37.020 |
| Subtotal | | | 3.537 | 5.251 | | - | | - | | - | | - | 0.000 | 8.788 | N/A |

Remarks
Activities include, but not limited to, detailed test planning and provisioning to include the writing of a detailed test and safety plans, setting up the test execution data and documentation management infrastructure, developing data analysis tools, provisioning for test assets, instrumentation and ranges. Activities may be accomplished utilizing

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0307581F / JSTARS Recap | Project (Number/Name) 650003 / JSTARS Recapitalization |
|--|--|--|

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| the DoD Major Ranges & Test Facilities which include, but not limited to, the AFTC (412TW and 96TH), Joint Interoperability Test Center (JITC), the 346th TS, Live Fire Test Organizations (AFLMC/EZJA and 96th TG Det 1), and Operational Test Agencies (AFOTEC). | | | | | | | | | | | | | | | |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| FFRDC | Various | Various : Bedford, MA | 21.580 | 7.500 | Oct 2017 | - | | - | | - | | - | 0.000 | 29.080 | 130.000 |
| PASS Support (A and AS) | Various | Various : Bedford, MA | 5.008 | 3.200 | Nov 2017 | - | | - | | - | | - | 0.000 | 8.208 | 26.654 |
| ETASS Support (A and AS) | Various | Various : Bedford, MA | 4.300 | 2.200 | Nov 2017 | - | | - | | - | | - | 0.000 | 6.500 | 24.749 |
| PMA and additional risk reduction activities | Various | Various : Bedford, MA | 63.513 | 13.700 | Oct 2017 | - | | - | | - | | - | 0.000 | 77.213 | 86.325 |
| Subtotal | | | 94.401 | 26.600 | | - | | - | | - | | - | 0.000 | 121.001 | N/A |

Remarks
 EMD contract award assumption is last half of FY18 (4QFY18 used for budgetary purposes). Management services are required to support an aggressive schedule leading to a Critical Design Review (CDR) within one year of contract award. This will require expertise and manpower to review CDRLs, software and documentation; analyze and model performance; and identify and mitigate risks.
 Leading up to contract award, management services will support source selection and EMD preparation activities. These activities focus on ensuring operational effectiveness through Owning the Technical Baseline: modeling and simulation to understand design trade-space, establishment of a System Integration Lab (SIL) and tool development to assess Open Systems Architecture (OSA) and Open Mission Systems (OMS) compliance that ensures future affordability and agility.

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|
| Project Cost Totals | 278.180 | 390.713 | 0.000 | - | - | - | 0.000 | 668.893 | N/A |

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|--|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0307581F / JSTARS Recap | Project (Number/Name) 650003 / JSTARS Recapitalization |
|--|--|--|

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|--|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---|---------|--|--|--|---------|--|--|--|---------|--|--|--|---------|--|--|--|---------|--|--|--|---------|--|--|--|---------|--|--|--|
| JSTARs Recap | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Radar Risk Reduction Activities | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Milestone B | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Contract Award | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Engineering and Manufacturing Development | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CDA buys/deliveries | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Developmental Test and Evaluation | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force **Date:** February 2019

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|--|---|---|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0307581F / <i>JSTARS Recap</i> | Project (Number/Name) 650003 / <i>JSTARS Recapitalization</i> |
|--|---|---|

Schedule Details

| Events by Sub Project | Start | | End | |
|---|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>JSTARs Recap</i> | | | | |
| Radar Risk Reduction Activities | 2 | 2018 | 4 | 2018 |
| Milestone B | 4 | 2018 | 4 | 2018 |
| Contract Award | 4 | 2018 | 4 | 2018 |
| Engineering and Manufacturing Development | 4 | 2018 | 4 | 2022 |
| CDA buys/deliveries | 4 | 2018 | 2 | 2022 |
| Developmental Test and Evaluation | 4 | 2019 | 4 | 2022 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|--|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0401310F / <i>C-32 Executive Transport Recapitalization</i> |
|---|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 2.918 | 7.943 | 9.930 | 0.000 | 9.930 | 9.926 | 9.953 | 10.134 | 10.316 | Continuing | Continuing |
| 654019: <i>C-32 Executive Transport Recap</i> | - | 2.918 | 7.943 | 9.930 | 0.000 | 9.930 | 9.926 | 9.953 | 10.134 | 10.316 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

The C-32A mission is to provide Executive Airlift transportation for the First Lady, Vice President, Cabinet, Congress, and foreign Heads of State. The C-32A also serves as the backup to the VC-25 Presidential support aircraft.

The C-32 Executive Transport Recapitalization program will replace the aging C-32A aircraft fleet. The Air Force and Navy are engaged in an effort to recapitalize the National Military Command System fixed-wing aircraft and large capacity Executive Airlift fleets. The aircraft consist of the Air Force E-4B National Airborne Operations Center (NAOC), Air Force C-32A Executive Airlift (EA), and the Navy E-6B Airborne Command Post (ABNCP) and Take Charge and Move Out (TACAMO) aircraft. These platforms are aging and increasingly difficult to support. The combined effort will explore the realignment of missions among platforms and examine the potential benefits of acquiring common airframes without sacrificing operational effectiveness or increasing overall costs. This is being conducted through the NEAT (N=NAOC, E=EA, A= ABNCP, T=TACAMO) Analysis of Alternatives (AoA).

This budget supports funding to complete a joint service AoA in collaboration with the E-4B and E-6B Recapitalization programs to explore commonality of the airframe and interoperability of the mission equipment. Funding continues establishment of the Program Office and begins acquisition strategy development. Funding also supports cost/performance trade studies.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver C-32A capabilities. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, 0605898F, and 0605833F.

This program is currently programmed in Budget Activity (BA) 5. However, the program is in the Materiel Solution Analysis Phase conducting an AoA. Post AoA Materiel Development Decisions (MDD), to determine acquisition milestone entry point for one or more follow-on Acquisitions, is projected in 1Q FY20. The program is Pre-Milestone B and is not conducting Engineering and Manufacturing Development (EMD). [Note: The following statement is system generated due to being in BA5 and cannot be omitted at this time.]

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|--|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0401310F / <i>C-32 Executive Transport Recapitalization</i> |
|---|--|

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 6.017 | 7.943 | 9.930 | 0.000 | 9.930 |
| Current President's Budget | 2.918 | 7.943 | 9.930 | 0.000 | 9.930 |
| Total Adjustments | -3.099 | 0.000 | 0.000 | 0.000 | 0.000 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | -3.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -0.099 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Change Summary Explanation

FY18- funding reduced by Congressional mark -\$3M "Program office excess to need", -\$0.099M SBIR transfer.

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| Title: C-32 Executive Transport Recapitalization Analysis of Alternatives | 2.500 | 4.000 | 7.000 | 0.000 | 7.000 |
| Description: Continue AoA activities to assess potential materiel solutions to mitigate current capability gaps. | | | | | |
| FY 2019 Plans: Funds in FY2019 will conduct requests for information (RFI) and continue AoA activities. | | | | | |
| FY 2020 Base Plans: Funds in FY2020 will complete the AoA, support the Materiel Development Decision (MDD), begin materiel solution analysis activities and start technology maturation risk reduction activities. | | | | | |
| FY 2020 OCO Plans: N/A | | | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: | | | | | |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0401310F / C-32 Executive Transport Recapitalization |
|---|---|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|---------|---------|-----------------|----------------|------------------|
| The increase in funding is due to statutory/regulatory documentation, final AoA out-brief, and program initiation. | | | | | |
| Title: C-32 Executive Transport Recapitalization Program Office Standup Description: Continue standup of Program Office to support AoA closeout and early acquisition activities. FY 2019 Plans: Funds in FY2019 continue the establishment of a Program Office to support AoA closeout and early acquisition activities. FY 2020 Base Plans: Funds in FY2020 support the Materiel Development Decision (MDD), Program Office support tasks, A&AS costs, travel, and PMA FY 2020 OCO Plans: N/A FY 2019 to FY 2020 Increase/Decrease Statement: The decrease in funding is because the initial outlay for standing up the program office was in FY19 and FY20 reflects normalizing program office operational costs. | 0.418 | 3.943 | 2.930 | 0.000 | 2.930 |
| Accomplishments/Planned Programs Subtotals | 2.918 | 7.943 | 9.930 | 0.000 | 9.930 |

D. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

E. Acquisition Strategy

The C-32A Executive Transport Recapitalization effort acquisition strategy will be fully developed after the completion of the AoA.

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|---|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0401310F / C-32 Executive Transport Recapitalization | Project (Number/Name) 654019 / C-32 Executive Transport Recap |
|--|---|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| C-32 Executive Transport Recapitalization Analysis of Alternatives | MIPR | ASC/XRX : WPAFB, OH | - | 0.750 | Mar 2018 | 4.000 | Mar 2019 | 7.000 | | - | | 7.000 | Continuing | Continuing | - |
| Subtotal | | | - | 0.750 | | 4.000 | | 7.000 | | - | | 7.000 | Continuing | Continuing | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| C-32 Executive Transport Recapitalization Other Government Costs | Various | AFLCMC/WV : Dayton, OH | - | 2.168 | Apr 2018 | 3.943 | Jan 2019 | 2.930 | | - | | 2.930 | Continuing | Continuing | - |
| Subtotal | | | - | 2.168 | | 3.943 | | 2.930 | | - | | 2.930 | Continuing | Continuing | N/A |

| | | | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|--|--|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|
| Project Cost Totals | | | - | 2.918 | 7.943 | 9.930 | - | 9.930 | Continuing | Continuing | N/A |

Remarks
Other Government Costs include A&AS, travel, and PMA

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| | | |
|---|--|---|
| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0401310F / C-32 Executive Transport Recapitalization | Project (Number/Name) 654019 / C-32 Executive Transport Recap |

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|--------------------------------------|---------|--|--|--|---------|--|--|--|---------|--|--|--|---------|--|--|--|---------|--|--|--|---------|--|--|--|---------|--|--|--|
| C-32 Recap | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Program Office Standup | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| AoA Study Planning | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RFI Event #1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RFI Event #2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| AoA | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mission Realignment Review | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Post AoA MDD | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Technology Maturation Risk Reduction | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| EMD | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0401310F / C-32 Executive Transport Recapitalization | Project (Number/Name) 654019 / C-32 Executive Transport Recap |

Schedule Details

| Events by Sub Project | Start | | End | |
|--------------------------------------|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| C-32 Recap | | | | |
| Program Office Standup | 3 | 2018 | 1 | 2020 |
| AoA Study Planning | 3 | 2018 | 1 | 2019 |
| RFI Event #1 | 3 | 2018 | 3 | 2019 |
| RFI Event #2 | 3 | 2018 | 3 | 2019 |
| AoA | 4 | 2018 | 1 | 2020 |
| Mission Realignment Review | 2 | 2019 | 1 | 2020 |
| Post AoA MDD | 2 | 2020 | 2 | 2020 |
| Technology Maturation Risk Reduction | 2 | 2020 | 2 | 2022 |
| EMD | 3 | 2022 | 4 | 2024 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|--|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force / BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0401319F / VC-25B |
|---|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | 599.678 | 418.500 | 657.932 | 757.923 | 0.000 | 757.923 | 718.324 | 585.473 | 514.522 | 354.688 | 68.563 | 4,675.603 |
| 655250: VC-25B | 599.678 | 418.500 | 657.932 | 757.923 | 0.000 | 757.923 | 718.324 | 585.473 | 514.522 | 354.688 | 68.563 | 4,675.603 |
| Quantity of RDT&E Articles | 2 | - | - | - | - | - | - | - | - | - | - | - |

Program MDAP/MAIS Code: 425

Note

FY10-14 Prior Years Funding \$27.29M was executed in PE 0401314F, BPAC 675355

A. Mission Description and Budget Item Justification

The VC-25B Program, formerly known as the Presidential Aircraft Recapitalization (PAR) Program, will replace the Presidential VC-25A fleet which faces capability gaps, rising maintenance costs, and parts obsolescence as it ages beyond 30 years. The VC-25B Program Office will deliver a new fleet of aircraft to meet the requirements for the President to execute the duties of Head of State, Chief Executive, and Commander-in-Chief. The VC-25B Program will uniquely modify two Boeing 747-8 commercial aircraft to provide the President, staff, and guests with safe and reliable air transportation with the equivalent level of communications capability and security available in the White House. The modifications to the 747-8 aircraft will include an electrical power upgrade with dual Auxiliary Power Units that are usable in flight, a mission communication system, a work and rest environment, an executive interior, military avionics, a self-defense system, autonomous enplaning and deplaning, and autonomous baggage loading. No significant changes to the existing VC-25A Concept of Operations or Concept of Employment are expected.

In August 2012, the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L)) approved the VC-25B Materiel Development Decision. The Capability Development Document (CDD) was validated by the Joint Requirements Oversight Council in November 2014. In January 2015, the Secretary of the Air Force's Determination and Findings designated the Boeing 747-8 aircraft as the airframe platform, and the USD (AT&L)'s Acquisition Decision Memorandum authorized Pre-Milestone B (Pre-MS B) contracts aimed at improving affordability and reducing program execution risk. In February 2015, the Assistant Secretary of the Air Force for Acquisition approved a Justification and Approval designating Boeing as the sole source for Pre-MS B activities; and Post-MS B design, integration, modification, and test activities. USD(AT&L) approved the initial acquisition strategy in September 2015. MS B certification occurred in September 2016. In March 2017, the White House reaffirmed the minimum set of requirements necessary to meet Presidential mission needs; these requirements are codified in the March 2017 CDD. Under Secretary of Defense for Acquisition and Sustainment (USD(A&S)) approved the updated acquisition strategy and the Acquisition Program Baseline (APB) in December 2018.

This budget supports Post-MS B design, integration, modification, and test of two aircraft to make them Presidential mission ready. In FY18 and FY19, the program continued Preliminary Design (PD) and awarded the Engineering and Manufacturing Development (EMD) contract modification. In FY20, the program will continue EMD activities to include design, integration, modification, and test, as well as begin Product Support (PS) activities.

Funds may be used to address emerging and short-notice Diminishing Manufacturing Sources and Material Shortage (DMSMS) issues.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0401319F / VC-25B |
|---|--|

This program element includes necessary civilian pay expenses required to manage, execute, and deliver the VC-25B system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, and 0605898F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 434.069 | 673.032 | 739.123 | 0.000 | 739.123 |
| Current President's Budget | 418.500 | 657.932 | 757.923 | 0.000 | 757.923 |
| Total Adjustments | -15.569 | -15.100 | 18.800 | 0.000 | 18.800 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | -15.100 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -15.569 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 18.800 | 0.000 | 18.800 |

Change Summary Explanation

The FY18 funding was reduced by \$15.569M due to Small Business Innovative Research (SBIR) transfer.

The FY19 funding was reduced by \$15.1M due to a Congressional mark, (\$5.1M EMD hot start unjustified) and (\$10M EMD funding unjustified).

The FY19 funding is expected to be reduced by an additional \$23.599M due to SBIR transfer.

The FY20 funding was increased by \$18.8M to fully fund VC-25B to the Acquisition Program Baseline.

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| Title: VC-25B PD, EMD, Product Support, & Program Management Administration (PMA) | 417.650 | 656.701 | 755.388 | 0.000 | 755.388 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
|--|----------------------------|

| | |
|---|--|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force / BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0401319F / VC-25B |
|---|--|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|---------|---------|--------------|-------------|---------------|
|---|---------|---------|--------------|-------------|---------------|

Description: Continue PD activities and utilize modeling and simulation, system integration labs, and mockups to assist in design; execute EMD activities; and accomplish PMA to support the Program Office. FY20 will continue EMD activities such as the management, detailed design, integration, modification, test/verification, certification, and product support to deliver two Presidential mission-ready VC-25B Aircraft.

FY 2019 Plans:
Funds in FY 2019 continue PD and EMD activities, and support PMA.

FY 2020 Base Plans:
Funds in FY 2020 will continue EMD activities, begin product support activities, and support PMA.

FY 2020 OCO Plans:
N/A

FY 2019 to FY 2020 Increase/Decrease Statement:
The increase in funding shown is misrepresented. The FY20 budget reflects the VC-25B APB with a \$141M shortfall in FY19. The FY19 shortfall will be addressed as part of the budgeting process. If approved, there will be a FY19 to FY20 decrease in funding due to the purchase of material long-lead items in FY19, and the transition from more costly design activities to the actual modification of the aircraft.

| | | | | | |
|--------------------------------------|-------|-------|-------|-------|-------|
| Title: VC-25B Government Test | 0.850 | 1.231 | 2.535 | 0.000 | 2.535 |
|--------------------------------------|-------|-------|-------|-------|-------|

Description: Government test activities to prepare for, oversee, and conduct test events.

FY 2019 Plans:
Funds in FY 2019 are being used for Systems Integration Laboratory (SIL) development and design discussions for events leading to CDR; and participation in early test planning and reviews.

FY 2020 Base Plans:
Funds in FY 2020 will be used to conduct test planning with Joint Interoperability Test Command (JITC), Lead Developmental Test and Evaluation Organization (LDTO), and Facilities/Ranges; as well as participate in working groups and reviews.

FY 2020 OCO Plans:
N/A

FY 2019 to FY 2020 Increase/Decrease Statement:

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|--|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force / BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0401319F / VC-25B |
|---|--|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|---------|---------|-----------------|----------------|------------------|
| The increase in funding is due to ramp-up of test planning activities in support of JITC, LDTO, and Facilities/Ranges, as well as the ramp-up of test planning activities related to the Mission Communication System (MCS) and SILs. | | | | | |
| Accomplishments/Planned Programs Subtotals | 418.500 | 657.932 | 757.923 | 0.000 | 757.923 |

| D. Other Program Funding Summary (\$ in Millions) | | | | | | | | | | | |
|---|----------------|----------------|-------------------------|------------------------|--------------------------|----------------|----------------|----------------|----------------|-----------------------------|-------------------|
| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020 Base</u> | <u>FY 2020 OCO</u> | <u>FY 2020 Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To Complete</u> | <u>Total Cost</u> |
| • MILCON PE 0401319F: <i>PAR Facilities</i> | 142.384 | 166.116 | 86.000 | - | 86.000 | - | - | - | - | 0.000 | 394.500 |
| • OPAF 03 Lineitem 843050: <i>PAR Mechanized Material Handling Equip</i> | - | 41.110 | - | - | - | - | - | - | - | 0.000 | 41.110 |
| • OPAF 03 Lineitem 8347240: <i>PAR CCTV/Audiovisual Equipment</i> | - | 3.005 | - | - | - | - | - | - | - | 0.000 | 3.005 |
| • OPAF 03 Lineitem 837300: <i>PAR Base Comm Infrastructure</i> | - | - | 4.010 | - | 4.010 | 0.500 | 2.600 | 1.700 | - | 0.000 | 8.810 |
| • O&M O&M: PE 0401319F: <i>PAR Furnishings and Equipment</i> | - | - | - | - | - | 1.951 | - | - | - | 0.000 | 1.951 |

Remarks

E. Acquisition Strategy
 USD(AT&L) approved the initial VC-25B Acquisition Strategy in September 2015. USD(A&S) approved the updated VC-25B Acquisition Strategy and set the APB in December 2018. The FY20 budget reflects the VC-25B APB with a \$141M shortfall in FY19. The FY19 shortfall will be addressed as part of the budgeting process. The VC-25B Program will integrate technologically mature subsystems into commercial Boeing 747-8 aircraft. The VC-25B Program will design, integrate, modify, and test two aircraft to make them Presidential mission ready. Boeing is the prime integrator for VC-25B development activities. The VC-25B Program has a single contract with multiple major contract modifications which include risk reduction activities, 747-8 commercial aircraft purchase, PD, EMD, and Product Support. The contract for risk reduction activities was awarded in January 2016. The contract modification to purchase two commercial aircraft was awarded in August 2017. The contract modification for PD was awarded in September 2017. The contract modification for EMD was awarded in July 2018.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|--|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force / BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0401319F / VC-25B |
|---|--|

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|---|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0401319F / VC-25B | Project (Number/Name) 655250 / VC-25B |
|--|--|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| VC-25B Contract Activities | SS/ Various | The Boeing Company : Various | 585.002 | 410.943 | Jul 2018 | 643.125 | | 741.728 | | - | | 741.728 | 2,114.129 | 4,494.927 | - |
| Subtotal | | | 585.002 | 410.943 | | 643.125 | | 741.728 | | - | | 741.728 | 2,114.129 | 4,494.927 | N/A |

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| VC-25B Developmental Test and Evaluation | MIPR | 412 TW, JITC : Various | 0.754 | 0.850 | Oct 2017 | 1.231 | Dec 2018 | 2.535 | Dec 2019 | - | | 2.535 | 58.910 | 64.280 | - |
| Subtotal | | | 0.754 | 0.850 | | 1.231 | | 2.535 | | - | | 2.535 | 58.910 | 64.280 | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| VC-25B Other Government Costs | Various | AFLCMC/WV : WPAFB, OH | 5.056 | 2.941 | Nov 2017 | 9.504 | Nov 2018 | 9.477 | Nov 2019 | - | | 9.477 | 45.632 | 72.610 | - |
| VC-25B A&AS | C/T&M | AFLCMC/WL : WPAFB, OH | 8.866 | 3.766 | Feb 2018 | 4.072 | Feb 2019 | 4.183 | Feb 2020 | - | | 4.183 | 22.896 | 43.783 | - |
| Subtotal | | | 13.922 | 6.707 | | 13.576 | | 13.660 | | - | | 13.660 | 68.528 | 116.393 | N/A |

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract | |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|-----|
| Project Cost Totals | | 599.678 | 418.500 | 657.932 | 757.923 | - | 757.923 | 2,241.567 | 4,675.600 | N/A |

Remarks
FY 2010-2014 RDT&E Funding (\$27.3M) was executed in PE 0401314F, Project 675355, BA07.

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|---|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0401319F / VC-25B | Project (Number/Name) 655250 / VC-25B |
|--|--|---|

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|--|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
|------------------------------------|--|
| VC-25B | |
| Pre-MS B Risk Reduction Activities | |
| PD | |
| In-Progress Review, FY18 | |
| PDR | |
| EMD | |
| In-Progress Review, FY19 | |
| CDR | |
| Product Support | |

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|---|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0401319F / VC-25B | Project (Number/Name) 655250 / VC-25B |
|--|--|---|

Schedule Details

| Events by Sub Project | Start | | End | |
|------------------------------------|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| VC-25B | | | | |
| Pre-MS B Risk Reduction Activities | 1 | 2018 | 2 | 2018 |
| PD | 1 | 2018 | 1 | 2019 |
| In-Progress Review, FY18 | 3 | 2018 | 3 | 2018 |
| PDR | 1 | 2019 | 1 | 2019 |
| EMD | 4 | 2018 | 4 | 2024 |
| In-Progress Review, FY19 | 1 | 2019 | 1 | 2019 |
| CDR | 4 | 2019 | 4 | 2019 |
| Product Support | 4 | 2020 | 4 | 2024 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0701212F / <i>Automated Test Systems</i> |
|---|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 17.850 | 13.653 | 2.787 | 0.000 | 2.787 | 17.200 | 9.918 | 2.886 | 23.000 | Continuing | Continuing |
| 6506TE: <i>Test And Evaluation Support Budget Authority</i> | - | 17.850 | 13.653 | 2.787 | 0.000 | 2.787 | 17.200 | 9.918 | 2.886 | 23.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

Program MDAP/MAIS Code: 6506

Note
 The Automatic Test System program office is responsible for developing, acquiring and sustain Automatic Test Systems for the United States Air Force (USAF).

The Bomber Armament Tester is replacing six legacy testers and combining their capabilities into one tester. The Bomber Armament Tester will support the B-2, B-1 and B-52 platforms.

The Common Aircraft Portable Reprogramming Equipment (CAPRE) is a secure common Memory Loader Verifier (MLV) that loads operational flight programs for 32 USAF weapons systems. Weapon Systems include but are not limited to A-10, B-1, B-52, C-5, C-17, C-130, CV-22, F-15, F-16, H-60 and KC-46.

A. Mission Description and Budget Item Justification

The Bomber Armament Tester will ensure that our USAF bomber fleet can conduct nuclear deterrence, global power projection and global strike operations to support the President of the United States and Combatant Commanders by providing a reliable, cyber secure, and sustainable tester. The tasks are to develop a common bomber armament tester and the Test Program Sets (Software, Hardware, and Documentation) to test the armament release equipment on the bombers.

RDT&E efforts support development, testing, and producibility of the Bomber Armament Tester and Test Program Sets. The program will utilize an incremental development approach with B-2 as Increment 1, B-1 as Increment 2, and B-52 as Increment 3.

The Common Aircraft Portable Reprogramming Equipment (CAPRE) Secure Memory Loader Verifier (SMLV) is a secure common memory loader verifier that loads operational flight programs to the weapon systems. . CAPRE leads the fleet on Cyber initiatives and is government owned and developed. CAPRE supports 32 USAF weapon systems including but not limited to A-10, B-1, B-52, C-5, C-17, C-130, CV-22, F-15, F-16, H-60 and KC-46.

RDT&E effort includes developing a Network Interface Module (NIM) that provides additional cyber hardening to the CAPRE system and redesigning the current CAPRE system to adapt to the NIM. RDT&E effort also includes software development for NIM interfaces and new weapons systems moving to the CAPRE system from other MLV systems. The goal is to provide one common cyber secure MLV for the Air Force that minimizes cyber vulnerabilities in weapon systems.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0701212F / <i>Automated Test Systems</i> |
|---|---|

This program element may include necessary civilian pay expenses required to manage, execute, and deliver Automatic Test Systems Program Office weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, and 0605898F."

This program element also includes program administrative cost for the Automatic Test Systems program office and funds the cost of studies and research to support the Automatic Test Systems fleet.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 18.528 | 13.653 | 0.000 | 0.000 | 0.000 |
| Current President's Budget | 17.850 | 13.653 | 2.787 | 0.000 | 2.787 |
| Total Adjustments | -0.678 | 0.000 | 2.787 | 0.000 | 2.787 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -0.678 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 2.787 | 0.000 | 2.787 |

Change Summary Explanation

FY 2020 funding increase restores Automated Test System line

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| Title: Bomber Armament Tester | 1.500 | 13.653 | 0.000 |
| Description: New Common Bomber Armament Tester for B-1, B-2, and B-52. | | | |
| FY 2019 Plans: | | | |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0701212F / <i>Automated Test Systems</i> |
|---|---|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| - Continue to develop Bomber Armament Tester and Test Program Sets for use with B-2 - Conduct additional test with B-2 - Requirements analysis for increments 1 and 2. This will include the most complex B-1 and B-52 test program set development. FY 2020 Plans: No FY20 funding for Bomber Armament Tester FY 2019 to FY 2020 Increase/Decrease Statement: Funding ramp down. Will address in future budget requests | | | |
| Title: Common Aircraft Portable Reprogramming Equipment (CAPRE) Description: Development of a common cyber secure Memory Loader Verifier for the Air Force. FY 2019 Plans: N/A FY 2020 Plans: Development of Aircraft Adapter Group (AAG) software and cabling to re-host F-16 Viper and legacy CAPRE groups to the NIM FY 2019 to FY 2020 Increase/Decrease Statement: Funding restores CAPRE efforts | 16.350 | 0.000 | 2.787 |
| Accomplishments/Planned Programs Subtotals | 17.850 | 13.653 | 2.787 |

D. Other Program Funding Summary (\$ in Millions)

| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> <u>Base</u> | <u>FY 2020</u> <u>OCO</u> | <u>FY 2020</u> <u>Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To</u> <u>Complete</u> | <u>Total Cost</u> |
|---|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|
| • APAF 07 00071: <i>Replacement Support Equipment</i> | 7.782 | 12.000 | - | - | - | - | - | - | - | 0.000 | 19.782 |

Remarks
 Other program funding includes procurement funds for Bomber Armament Tester Program and the Common Aircraft Portable Reprogrammable Equipment.

E. Acquisition Strategy

Acquisition Strategy for the Bomber Armament Tester (BAT) was approved by AFPEO/ Agile Combat Support on 12 November 2015 . The BAT program will use an incremental approach based on customer needs to satisfy this requirement. Increment 1 includes the development of the core test set, the B-2A requirements and development of the most complex B-1B and B-52 test program sets. Increment 2 consist of the B-1B development and Increment 3 consists of the B-52H requirements.

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 0701212F / <i>Automated Test Systems</i> | |
| <p>Currently increments 2 and 3 are unfunded through the FYDP. The BAT program will utilize full and open competition to award the contract. Contract awarded September 28, 2017.</p> <p>The Acquisition strategy for Common Aircraft Portable Reprogrammable Equipment (CAPRE) Secure Memory Loader Verifier. (SMLV) is to use the original government manufacturer to develop the NIM , software and hardware development. Acquisition Strategy for CAPRE was approved by the Milestone Decision Authority in June 2017.</p> <p>F. Performance Metrics</p> <p>Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.</p> | | |

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0701212F / Automated Test Systems | Project (Number/Name) 6506TE / Test And Evaluation Support Budget Authority |
|--|--|--|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| CAPRE/CAPRE SMLV Development | PO | 309th OO-ALC : UT | - | 15.151 | Jun 2018 | - | | 0.877 | Oct 2019 | - | | 0.877 | Continuing | Continuing | - |
| BAT Development | C/CPAF | Not specified. : CA | - | - | | 9.500 | Jul 2019 | - | | - | | - | Continuing | Continuing | - |
| Subtotal | | | - | 15.151 | | 9.500 | | 0.877 | | - | | 0.877 | Continuing | Continuing | N/A |

Remarks
Product Development Cost include the development of the Bomber Armament Test Sets (Units under test Software, hardware and Technical Data), Technical Data and maintenance of Government Furnished Equipment.

Development efforts include developing a Network Interface Module (NIM) that provides additional cyber hardening to the CAPRE system and redesigning the current CAPRE system to adapt to the NIM. Development effort also include software development for NIM interfaces and new weapons systems moving to the CAPRE system from other MLV systems. The goal is to provide one common cyber secure MLV for the Air Force.

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---------------------------------|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Logistic Support | C/CPIF | Not specified. : NV | - | 0.688 | | - | | - | | - | | - | Continuing | Continuing | - |
| Subtotal | | | - | 0.688 | | - | | - | | - | | - | Continuing | Continuing | N/A |

Remarks
Support Cost include Independent verification and validation support, Nuclear Certification Support and Cyber Security authority support.

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Development and Operation Testing support | C/CPIF | Not specified. : NV | - | 0.393 | Jan 2019 | 2.365 | | - | | - | | - | Continuing | Continuing | - |
| Subtotal | | | - | 0.393 | | 2.365 | | - | | - | | - | Continuing | Continuing | N/A |

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0701212F / Automated Test Systems | Project (Number/Name) 6506TE / Test And Evaluation Support Budget Authority |
|--|--|--|

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |

Remarks
Environmental testing of the Bomber Armament Tester and operational testing of the test program sets for the B-2 and most complex B-1 and B-52

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| BAT Travel | Various | Not specified. : NV | - | 0.100 | Sep 2018 | 0.100 | Sep 2019 | 0.100 | Sep 2020 | - | | 0.100 | Continuing | Continuing | - |
| BAT Program Management Support | C/FFP | Not specified. : NV | - | 1.268 | May 2018 | 1.268 | May 2019 | 1.268 | May 2020 | - | | 1.268 | Continuing | Continuing | - |
| CAPRE/CAPRE SMLV Travel | Various | Not specified. : NV | - | 0.100 | Sep 2018 | 0.100 | Sep 2019 | 0.050 | Sep 2019 | - | | 0.050 | Continuing | Continuing | - |
| CAPRE/ CAPRE SMLV Program Management Support | C/FFP | Not specified. : NV | - | 0.150 | Jun 2018 | 0.320 | May 2019 | 0.492 | Jun 2020 | - | | 0.492 | Continuing | Continuing | - |
| Subtotal | | | - | 1.618 | | 1.788 | | 1.910 | | - | | 1.910 | Continuing | Continuing | N/A |

Remarks
PMA costs include travel to support the development of the Bomber Armament Tester. PMA cost also include an Information Assurance expert, Assistance and advisory service contractors to provide support to the program office during the development of the program. The program element may include necessary civilian pay expenses required to manage, execute and deliver Automatic Test System capability.

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|
| Project Cost Totals | - | 17.850 | 13.653 | 2.787 | - | 2.787 | Continuing | Continuing | N/A |

Remarks

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0701212F / <i>Automated Test Systems</i> | Project (Number/Name) 6506TE / <i>Test And Evaluation Support Budget Authority</i> |

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|--|---------|--|---|--|---------|--|--|---|---------|--|--|---|---------|--|--|--|---------|--|--|--|---------|--|--|--|---------|--|--|--|
| Automatic Test Systems | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BAT Milestone C Decision | | | | | | | | ■ | | | | | | | | | | | | | | | | | | | | |
| Inc 2 EMD - B-1B TPS | | | | | | | | | | | | ■ | | | | | | | | | | | | | | | | |
| TPS FIAT (PCA/FCA) | | | | | | | | | | | | ■ | | | | | | | | | | | | | | | | |
| CAPRE NIM Initial prototyping | | | ■ | | | | | | | | | | | | | | | | | | | | | | | | | |
| CAPRE CDR | | | ■ | | | | | | | | | | | | | | | | | | | | | | | | | |
| CAPRE NIM Baseline Design/Drawing and Software | | | ■ | | | | | | | | | | | | | | | | | | | | | | | | | |
| CAPRE Software Development (Weapon Sytem Transition) | | | ■ | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cable Design | | | ■ | | | | | | | | | | | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 0701212F / <i>Automated Test Systems</i> | Project (Number/Name) 6506TE / <i>Test And Evaluation Support Budget Authority</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Automatic Test Systems</i> | | | | |
| BAT Milestone C Decision | 4 | 2019 | 4 | 2019 |
| Inc 2 EMD - B-1B TPS | 3 | 2020 | 3 | 2021 |
| TPS FIAT (PCA/FCA) | 3 | 2020 | 4 | 2020 |
| CAPRE NIM Initial prototyping | 3 | 2018 | 4 | 2018 |
| CAPRE CDR | 3 | 2018 | 3 | 2018 |
| CAPRE NIM Baseline Design/Drawing and Software | 3 | 2018 | 2 | 2019 |
| CAPRE Software Development (Weapon Sytem Transition) | 3 | 2018 | 4 | 2019 |
| Cable Design | 3 | 2018 | 4 | 2019 |

Note
Schedule reflects increment one EMD. Increments two and three are currently unfunded.

CAPRE is government designed and development. Plan is to have original government manufacturer to handle this development effort.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 1203176F / <i>Combat Survivor Evader Locator</i> |
|---|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 24.099 | 0.939 | 2.000 | 0.000 | 2.000 | 0.974 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| 654522: <i>CSAR EMD</i> | - | 24.099 | 0.939 | 2.000 | 0.000 | 2.000 | 0.974 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

Note

This program, BA 5, PE 1203176F, project 654522, CSEL Next Generation Survival Radio Recapitalization (NGSR), is a new start.

A. Mission Description and Budget Item Justification

The Combat Survivor Evader Locator (CSEL) System provides aircrews with end-to-end global satellite secure emergency communication capability during combat and peace-time flying operations. CSEL provides a hand held radio as part of the mandatory aircrew survival gear. CSEL is a joint program (AF, Army, and Navy) and is the DoD program of record for personnel recovery survival radios. CSEL supports four of five Personnel Mission Phases: Report, Locate, Support, and Recover.

A National Security Agency (NSA) Cryptographic Modernization mandate and the Ultra High Frequency Follow-On satellite constellation are at the end of life and are driving upgrades to 60,000+ hand held radios and base stations. This effort includes development to modernize the system to integrate common waveforms, integrate broadcast reception for non-CSEL devices, provide for cryptographic modernization, leverage software defined capabilities based on the FY16 cryptographic study, and to procure intellectual property. This funding will also be used to perform various studies and analysis in support of the CSEL Enterprise.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver CSEL capabilities. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, 0605898F, and 0605833F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 1203176F / <i>Combat Survivor Evader Locator</i> |
|---|---|

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 24.967 | 0.939 | 0.000 | 0.000 | 0.000 |
| Current President's Budget | 24.099 | 0.939 | 2.000 | 0.000 | 2.000 |
| Total Adjustments | -0.868 | 0.000 | 2.000 | 0.000 | 2.000 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -0.868 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 2.000 | 0.000 | 2.000 |

Change Summary Explanation

FY 2020: +\$2.000M to fund completion of NGCA and begin development of Next Generation Survival Radio Recapitalization

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| <p>Title: CSEL Next Generation Cryptographic Architecture (NGCA)</p> <p>Description: A NSA cryptographic modernization mandate and the Ultra High Frequency Follow-On satellite constellation at end of life are both driving upgrades to CSEL Base Stations and Interrogation Module.</p> <p>FY 2019 Plans: Complete development and begin formal testing of NGCA.</p> <p>FY 2020 Plans: Complete NGCA Test & Evaluation (T&E).</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY2020 increased compared to FY2019 by \$0.061M. Justification for this increase is described in plans above.</p> | 24.099 | 0.939 | 1.000 |
| <p>Title: CSEL Next Generation Survival Radio Recapitalization (NGSR)</p> <p>Description: A NSA cryptographic modernization mandate and the Ultra High Frequency Follow-On satellite constellation at end of life are both driving upgrades to 60,000 handheld CSEL rescue radios.</p> <p>FY 2019 Plans:</p> | - | 0.000 | 1.000 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 1203176F / <i>Combat Survivor Evader Locator</i> |
|---|---|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|---------|---------|---------|
| N/A | | | |
| <i>FY 2020 Plans:</i> Begin development of NGSR | | | |
| <i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> FY2020 increased compared to FY2019 by \$1.000M. Justification for this increase is described in plans above. | | | |
| Accomplishments/Planned Programs Subtotals | 24.099 | 0.939 | 2.000 |

| D. Other Program Funding Summary (\$ in Millions) | | | | | | | | | | | |
|---|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|
| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> <u>Base</u> | <u>FY 2020</u> <u>OCO</u> | <u>FY 2020</u> <u>Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To</u> <u>Complete</u> | <u>Total Cost</u> |
| • OPAF 03 P-54: <i>OPAF: BA03:</i> <i>Line Item # 837170: Combat Survivor Evader Locator</i> | 3.004 | 0.000 | 0.000 | - | 0.000 | - | - | - | - | 0.000 | 3.004 |

Remarks
Funding will be used to purchase hardware to upgrade the Ultra High Frequency (UHF) Base Stations.

E. Acquisition Strategy
The CSEL overall strategy is competition focused. The Technical Data Package is being acquired under the NGCA contract to allow future competition of the CSEL Enterprise.

F. Performance Metrics
Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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| Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force | | | | | | | | | | | | Date: February 2019 | | | |
|--|------------------------|--|-------------|--|------------|---------|------------|-----------------------|------------|-------------|------------|---------------------|------------------|------------|--------------------------|
| Appropriation/Budget Activity | | | | R-1 Program Element (Number/Name) | | | | Project (Number/Name) | | | | | | | |
| 3600 / 5 | | | | PE 1203176F / Combat Survivor Evader Locator | | | | 654522 / CSAR EMD | | | | | | | |
| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | | | |
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | Target Value of Contract |
| CSEL NGCA - HW/SW Development | SS/CIPIF | The Boeing Company : Huntington Beach, CA | - | 14.503 | Aug 2018 | - | | - | | - | | - | Continuing | Continuing | - |
| Subtotal | | | - | 14.503 | | - | | - | | - | | - | Continuing | Continuing | N/A |
| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | | | |
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | Target Value of Contract |
| AIRWorks Next Generation Cryptographic Architecture (NGCA) Support | MIPR | NAVAIR : Saint Inigoes, MD | - | 5.601 | Mar 2018 | 0.539 | Jun 2019 | 1.000 | Dec 2019 | - | | 1.000 | Continuing | Continuing | - |
| Other Agency Support | MIPR | Various : TBD | - | 3.995 | Mar 2019 | 0.120 | Jul 2019 | - | | - | | - | Continuing | Continuing | - |
| NSA Certification Support | MIPR | CERDEC : TBD | - | - | | - | | 1.000 | May 2020 | - | | 1.000 | Continuing | Continuing | - |
| Subtotal | | | - | 9.596 | | 0.659 | | 2.000 | | - | | 2.000 | Continuing | Continuing | N/A |
| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | | | |
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | Target Value of Contract |
| Combined Test | MIPR | Electronic Proving Grnds : Fort Huachuca, AZ | - | - | | 0.140 | Mar 2019 | - | | - | | - | Continuing | Continuing | - |
| JITC Testing | MIPR | JITC : Fort Huachuca, AZ | - | - | | 0.140 | Aug 2019 | - | | - | | - | Continuing | Continuing | - |
| Subtotal | | | - | - | | 0.280 | | - | | - | | - | Continuing | Continuing | N/A |
| Project Cost Totals | | | - | 24.099 | | 0.939 | | 2.000 | | - | | 2.000 | Continuing | Continuing | N/A |

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|--|--------------------|----------------|---|---------------------|--------------------|--|----------------------------|-------------------|---------------------------------|--|
| Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force | | | | | | | Date: February 2019 | | | |
| Appropriation/Budget Activity 3600 / 5 | | | R-1 Program Element (Number/Name) PE 1203176F / <i>Combat Survivor Evader Locator</i> | | | Project (Number/Name) 654522 / <i>CSAR EMD</i> | | | | |
| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract | |

Remarks
 Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1203176F / <i>Combat Survivor Evader Locator</i> | Project (Number/Name) 654522 / <i>CSAR EMD</i> |

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
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| CSEL Next Generation Cryptographic Architecture (NGCA) | |
| CSEL NGCA Development | |
| CSEL NGCA Test & Evaluation (T&E) | |
| CSEL NGCA Fielding | |
| CSEL Next Generation Survival Radio (NGSR) | |
| CSEL NGSR Development | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1203176F / <i>Combat Survivor Evader Locator</i> | Project (Number/Name) 654522 / <i>CSAR EMD</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|---|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| CSEL Next Generation Cryptographic Architecture (NGCA) | | | | |
| CSEL NGCA Development | 2 | 2018 | 3 | 2019 |
| CSEL NGCA Test & Evaluation (T&E) | 4 | 2019 | 4 | 2020 |
| CSEL NGCA Fielding | 1 | 2021 | 2 | 2021 |
| CSEL Next Generation Survival Radio (NGSR) | | | | |
| CSEL NGSR Development | 3 | 2020 | 4 | 2021 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 1203269F / <i>GPS III Follow-On (GPS IIIIF)</i> |
|---|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 0.000 | 426.889 | 462.875 | 0.000 | 462.875 | 279.423 | 258.041 | 294.800 | 286.368 | Continuing | Continuing |
| 653170: <i>GPS IIIIF</i> | - | 0.000 | 426.889 | 462.875 | 0.000 | 462.875 | 279.423 | 258.041 | 294.800 | 286.368 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | 2 | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

The Global Positioning System (GPS) is a space-based navigation system that fills validated Joint Service requirements for worldwide, accurate, common grid three-dimensional positioning/navigation for military aircraft, ships, and ground personnel. The consistent accuracy, unaffected by location or weather and available in real time, significantly improves effectiveness of reconnaissance, weapons delivery, mine countermeasures and rapid deployment for all services. GPS must comply with Title 10 United States Code (USC) Sec. 2281, which requires that the Secretary of Defense ensures the continued sustainment and operation of GPS for military and civilian purposes, and 51 USC Sec. 50112, which requires that GPS complies with certain standards and facilitates international cooperation.

The system is composed of three segments: User Equipment (funded under Program Element (PE) 1203164F), Space (funded under PE 1203265F, 1203165F, and 1203269F), and a Control Network (funded under PE 1206423F and 1203165F). The satellites broadcast high-accuracy data using precisely synchronized signals that are received and processed by user equipment installed in military platforms. This equipment computes the platform position and velocity and provides steering vectors to target locations or navigation waypoints. The control segment provides daily updates to the navigation messages broadcast from the satellites to maintain system precision in three dimensions to 16 meters (spherical error probable) worldwide. Additionally, GPS supports the United States Nuclear Detonation (NUDET) Detection System (USNDS) mission and provides strategic and tactical support to the following Department of Defense (DoD) missions: Joint Operations by providing capabilities for Positioning, Navigation, and Timing (PNT); Command, Control, Communications, and Intelligence (C3I); Special Operations; Military Operations in Urban Terrain (MOUT); Defense-Wide Mission Support (DWMS); Air Mobility; and Space Launch Orbital Support.

GPS IIIIF delivers GPS III satellites beyond the first ten SVs being delivered by the GPS III program (funded in PE 1203265F GPS III Space Segment). The GPS IIIIF satellites maintain the same capabilities as the GPS III satellites, but also delivers significant enhancements to include: backward compatibility, unified S-Band (USB) interface compliance, integration of hosted payloads (redesigned USNDS), Laser Retro-reflector Arrays (LRAs), Search and Rescue/GPS (SAR/GPS), Energetic Charged Particles (ECP) sensor, and Regional Military Protection (RMP) capabilities that provide the ability to deliver high-power regional Military Code (M-Code) signals in specific areas of intended effect. Implementation of RMP into the GPS Enterprise requires integration with the ground and user segments, executed by the GPS Next Generation Operational Control System (OCX) and Military GPS User Equipment (MGUE) programs, respectively. The SAR/GPS payload provided by Canada fills a validated National Search and Rescue Committee requirement to provide enduring, space-based distress alerting capability to detect, locate, and relay distress alerts to fulfill its responsibilities under international agreements for Search and Rescue. LRA, built by the Naval Research Lab (NRL), is a passive reflector that improves accuracy and provides better ephemeris data. National Geospatial-Intelligence Agency (NGA) funds the integration costs of the LRA.

This PE funds the Research, Development, Test, and Evaluation (RDT&E) of GPS IIIIF SVs 11-12 (to include Non-Recurring Engineering (NRE) support efforts). This program includes risk-reducing simulators and systems engineering associated with delivering the new capabilities required of GPS IIIIF satellites.

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 1203269F / <i>GPS III Follow-On (GPS IIIIF)</i> |
|---|--|

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) is transforming the organization and implementation of space acquisition to an enterprise approach, maximizing innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose capabilities.

This PE may include necessary civilian pay expenses required to manage, execute, and deliver GPS IIIIF Space Segment weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in PEs 1206392F and 1206398F.

Re-Phasing of GPS IIIIF Buy Across FYDP saved \$11.360M in FY 2020. Re-Phasing of GPS IIIIF Buy Across FYDP description: Based on an adjustment for contract type, execution realism, and proposals, the Air Force is realigning GPS IIIIF funding to the Service Cost Position (SCP). All GPS program adjustments will fund higher priority space initiatives to improve lethality.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 0.000 | 451.889 | 474.235 | 0.000 | 474.235 |
| Current President's Budget | 0.000 | 426.889 | 462.875 | 0.000 | 462.875 |
| Total Adjustments | 0.000 | -25.000 | -11.360 | 0.000 | -11.360 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | -25.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | -11.360 | 0.000 | -11.360 |

Change Summary Explanation

FY 2019: -\$25.000M Congressional Mark due to insufficient justification

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 1203269F / <i>GPS III Follow-On (GPS IIIIF)</i> |
|---|--|

FY 2020: -\$11.360M Reduce GPS IIIIF Program funding to Service Cost Position (SCP)

C. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|---|---------|---------|---------|
| Title: GPS IIIIF (Follow-On) Development | - | 426.889 | 462.875 |
| Description: The program utilizes RDT&E funds to develop and deliver SVs 11-12, conduct the NRE of developing risk-reducing simulators, developing support test equipment, and conducting the systems engineering associated with delivering the new capabilities required of GPS IIIIF including backward compatibility, dual band Telemetry, Tracking, and Control (TT&C), integration of Government Furnished Equipment (GFE) hosted payloads, and RMP, which delivers high power regional M-Code signals in specific areas of intended effect. | | | |
| FY 2019 Plans: The program initiated efforts to complete an Integrated Baseline Review with Lockheed Martin in Q2FY19 to prepare for and to conduct a Critical Design Review (CDR) campaign from Q2FY19 through Q2FY20, continue development of SVs 11-12, and prepare for Milestone C in Q3FY20. Continue program office support and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc. | | | |
| FY 2020 Plans: The program office will complete Critical Design Review (CDR), continue non-recurring engineering efforts and hardware purchases to support SVs 11-12 development, GPS III Follow-On Production Non-flight Satellite Testbed (GNST+), and software simulators. Conduct Milestone C in Q3FY20 in preparation to exercise production satellite buys. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to, program office support, studies, technical analysis, prototyping, etc. | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 increased compared to FY 2019 by \$35.986M. Justification for this increase is described in plans above. | | | |
| Accomplishments/Planned Programs Subtotals | - | 426.889 | 462.875 |

D. Other Program Funding Summary (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|---------|---------|-----------------|----------------|------------------|---------|---------|---------|---------|---------------------|------------|
| • RDTE 07 1203265F: <i>GPS III Space Segment</i> | 233.043 | 141.892 | 42.440 | - | 42.440 | 10.780 | 7.296 | 7.451 | 7.585 | 5.900 | 456.387 |
| • SPAF 01 Line Item: GPS III: <i>GPS III Space Segment</i> | 84.064 | 69.386 | 31.466 | - | 31.466 | 20.143 | 21.320 | 19.332 | 19.680 | 26.400 | 291.791 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 1203269F / <i>GPS III Follow-On (GPS IIIIF)</i> |
|---|--|

D. Other Program Funding Summary (\$ in Millions)

| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> <u>Base</u> | <u>FY 2020</u> <u>OCO</u> | <u>FY 2020</u> <u>Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To</u> <u>Complete</u> | <u>Total Cost</u> |
|--|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|
| • SPAF 01 GPS IIIIF SPAF: <i>GPS IIIIF SPAF</i> | - | - | 414.625 | - | 414.625 | 628.445 | 890.355 | 897.544 | 962.300 | Continuing | Continuing |

Remarks

E. Acquisition Strategy

In December 2017, Principal Deputy Office of the Assistant Secretary of the Air Force (Acquisition & Logistics) declared the GPS IIIIF program a new start beginning in FY 2019 and, consistent with the 2016 National Defense Authorization Act, the program was categorized as an Acquisition Category (ACAT) IB Major Defense Acquisition Program (MDAP) with the Service Acquisition Executive (SAE) serving as the Milestone Decision Authority (MDA). During this time, the MDA approved the second phase of the two-phased GPS III Follow-On acquisition strategy. Executed using funds in PE 1203265F, GPS III Space Segment, the Phase 1 Production Readiness Feasibility Assessments conducted during FY 2016-2017 provided data and insight into contractors' GPS satellite production designs with emphasis on a mature navigation payload and production-ready designs. Phase 1 results affirmed the viability of a competitive approach for Phase 2. The Phase 2 strategy directed the Air Force to conduct a full-and-open competition for GPS IIIIF space vehicles and specified the use of RDT&E funds to deliver SVs 11-12 and conduct associated NRE. In addition to SVs 11-12, the RDT&E effort will be comprised of developing risk-reducing simulators, support test equipment, and conducting the systems engineering associated with delivering the new capabilities required of GPS IIIIF. The Air Force awarded the contract to Lockheed Martin in September 2018 and began the Integrated Baseline Review (IBR) in October 2018. Upon IBR completion, the 1-year CDR campaign will begin in Q2FY19. Upon Milestone C approval, the Air Force will procure SV 13+ via annual contract options exercised using Space Procurement, Air Force funds consistent with full-funding policy under an annual buy approach.

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1203269F / GPS III Follow-On (GPS IIIIF) | Project (Number/Name) 653170 / GPS IIIIF |
|--|---|--|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|---------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| GPS IIIIF Development | C/Various | Lockheed Martin : Littleton, CO | - | - | | 368.823 | Nov 2018 | 411.366 | Dec 2019 | - | | 411.366 | Continuing | Continuing | - |
| GPS IIIIF Technical Mission Analysis | MIPR | Various : Various | - | - | | 8.384 | Dec 2018 | 11.086 | Dec 2019 | - | | 11.086 | Continuing | Continuing | - |
| GPS IIIIF Enterprise SE&I | C/CPAF | SAIC : El Segundo, CA | - | - | | 13.470 | Dec 2018 | 13.936 | Dec 2019 | - | | 13.936 | Continuing | Continuing | - |
| Subtotal | | | - | - | | 390.677 | | 436.388 | | - | | 436.388 | Continuing | Continuing | N/A |

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| GPS IIIIF Test and Evaluation | Various | Various : Various | - | - | | 1.140 | Mar 2019 | 1.917 | Mar 2020 | - | | 1.917 | Continuing | Continuing | - |
| Subtotal | | | - | - | | 1.140 | | 1.917 | | - | | 1.917 | Continuing | Continuing | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|---------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| GPS IIIIF FFRDC | MIPR | Aerospace Corp : El Segundo, CA | - | - | | 7.345 | Dec 2018 | 3.695 | Dec 2019 | - | | 3.695 | Continuing | Continuing | - |
| GPS IIIIF A&AS | Various | Various : El Segundo, CA | - | - | | 27.327 | Jan 2019 | 20.475 | Dec 2019 | - | | 20.475 | Continuing | Continuing | - |
| GPS IIIIF Other Support | Various | Various : El Segundo, CA | - | - | | 0.400 | Oct 2018 | 0.400 | Oct 2019 | - | | 0.400 | Continuing | Continuing | - |
| Subtotal | | | - | - | | 35.072 | | 24.570 | | - | | 24.570 | Continuing | Continuing | N/A |

| | | | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|--|--|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|
| Project Cost Totals | | | - | - | 426.889 | 462.875 | - | 462.875 | Continuing | Continuing | N/A |

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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|--|---|--|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1203269F / GPS III Follow-On (GPS IIIIF) | Project (Number/Name) 653170 / GPS IIIIF |
|--|---|--|

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|
|--|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|

Remarks
 FINANCIAL PERFORMANCE: GPS IIIIF is evaluated against traditional Research and Development (R&D) program expenditure benchmarks. Unlike many traditional R&D programs, however, the GPS IIIIF Development and Production Acquisition phases contract is a Fixed Price Incentive Fee (FPIF) contract with progress payments. Up to 8 percent of incurred costs are withheld until the end of the contract, when they are liquidated. Mandatory funding obligations and progress payment withholds will cause the program to lag traditional expenditure benchmarks, painting an inaccurate portrait of overall program health.

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1203269F / GPS III Follow-On (GPS IIIIF) | Project (Number/Name) 653170 / GPS IIIIF |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|--|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|---|--|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GPS IIIIF | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GPS IIIIF Acquisition Decision | ■ | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GPS IIIIF Request for Proposal (RFP) Release | | ■ | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GPS IIIIF Contract Award | | | | ■ | | | | | | | | | | | | | | | | | | | | | | | | |
| GPS IIIIF CDR | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| GPS IIIIF Milestone C | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1203269F / <i>GPS III Follow-On (GPS IIIIF)</i> | Project (Number/Name) 653170 / <i>GPS IIIIF</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| GPS IIIIF | | | | |
| GPS IIIIF Acquisition Decision | 1 | 2018 | 1 | 2018 |
| GPS IIIIF Request for Proposal (RFP) Release | 2 | 2018 | 2 | 2018 |
| GPS IIIIF Contract Award | 4 | 2018 | 4 | 2018 |
| GPS IIIIF CDR | 2 | 2019 | 2 | 2020 |
| GPS IIIIF Milestone C | 3 | 2020 | 3 | 2020 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 1203940F / <i>Space Situation Awareness Operations</i> |
|---|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 9.684 | 46.015 | 76.829 | 0.000 | 76.829 | 70.704 | 51.977 | 16.067 | 19.643 | Continuing | Continuing |
| 65A037: <i>Ground Based Optical Sensor System (GBOSS)</i> | - | 9.684 | 46.015 | 76.829 | 0.000 | 76.829 | 70.704 | 51.977 | 16.067 | 19.643 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

Space Situational Awareness (SSA) is knowledge of all aspects of space related to operations. As the foundation for space control, SSA encompasses surveillance of all space objects and activities; detailed surveillance of specific space assets; monitoring space environmental conditions; monitoring cooperative space assets; gathering indications and warning on adversary space operations; and conducting integrated command, control, communications, processing, analysis, dissemination, and archiving activities. This program element fields, upgrades, operationalizes, operates and maintains Air Force sensors and information integration capabilities within the SSA network while companion program element 1206425F, Space Situational Awareness Systems, develops new network sensors and improved information integration capabilities across the network. Funds also support efforts such as engineering studies and analyses, architectural engineering studies, trade studies, technology needs forecasting, modernization initiatives, systems engineering, system development, and test & evaluation, and may include prototyping and technology demonstration. Activities funded in this program element (1203940F) focus on surveillance of objects in earth orbit to aid tasks including satellite tracking; space object identification; tracking and cataloging; satellite attack warning; notification of satellite flyovers to U.S. forces; space treaty monitoring; and technical intelligence gathering.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) is transforming the organization and implementation of space acquisition to an enterprise approach, maximizing innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose capabilities.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver Ground Based Optical Sensor System (GBOSS) capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392F and 1206398F.

Reduce Ground Based Optical Sensor System (GBOSS) saved \$85.000M in FY 2020. Reduce GBOSS description: Due to anticipated inability to execute an increase to program funding above the historical baseline in FY 2020, funds were adjusted to levels consistent with prior year execution. In alignment with the National Defense Strategy, funding was applied to improving of lethality including higher priority space technologies.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 1203940F / <i>Space Situation Awareness Operations</i> |
|---|---|

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 10.029 | 46.668 | 161.829 | 0.000 | 161.829 |
| Current President's Budget | 9.684 | 46.015 | 76.829 | 0.000 | 76.829 |
| Total Adjustments | -0.345 | -0.653 | -85.000 | 0.000 | -85.000 |
| • Congressional General Reductions | 0.000 | -0.653 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -0.345 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | -85.000 | 0.000 | -85.000 |

Change Summary Explanation

FY 2020: GBOSS reduced by \$85M for higher Air Force Space priorities.

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| Title: Ground Based Optical Sensor System (GBOSS) | 9.684 | 46.015 | 76.829 |
| Description: GBOSS provides global ground based optical sensor capability for Space Situational Awareness (SSA). GBOSS improves sensitivity, search rate, tracking of non-cooperative launches, precise tagging of clustered objects, and detection of closely spaced dim objects. This effort includes fielding GBOSS capabilities in optimal global locations, upgrading existing Ground-based Electro-Optical Deep Space Surveillance (GEODSS) sensors to improve sensitivity and search rates, and may acquire new advanced technology sensor(s) to improve global electro-optical sensor resilience and persistence. The effort will coordinate with Combined Space Operations Center (CSpOC), National Space Defense Center (NSDC), and National Air and Space Intelligence Center (NASIC) efforts to ensure enterprise data fusion and dissemination supporting Enterprise Space Battle Management Command, and Control (ESBMC2). | | | |
| FY 2019 Plans: Continue GBOSS Technology Maturation and Risk Reduction (TMRR) activities. Continue program office support and other related support activities that may include, but are not limited to, studies, technical analysis, prototyping, etc. | | | |
| FY 2020 Plans: | | | |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 1203940F / <i>Space Situation Awareness Operations</i> |
|---|---|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| Complete final GBOSS Technology Maturation and Risk Reduction activities and initiate Engineering Manufacturing Development. Rapidly respond to and implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to, program office support, studies, technical analysis, experimentation, prototyping, etc. | | | |
| <i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> FY 2020 increased compared to FY 2019 by \$30.814M. Justification for this increase is described above. | | | |
| Accomplishments/Planned Programs Subtotals | 9.684 | 46.015 | 76.829 |

D. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

E. Acquisition Strategy

Program established as an FY 2018 new start to address ground-based optical SSA gaps and shortfalls in supporting the Space Warfighting Construct (SWC). The acquisition strategy approved by AFPEO/SP in March 2018 accelerates the development and fielding of the solution, minimizing the time to address the requirements in light of current and emerging threats. Initial technology maturation and risk reduction will be executed using existing DoD, IC, and lab contracts. Final TMRR and Engineering and Manufacturing Development effort will be executed on a new contract awarded through full and open competition with a planned award date in 2019. The approved acquisition strategy supports fielding Initial Operational Capability (IOC) in the Pacific theater in 2021 and Final Operational Capability (FOC) of the global capability in 2023.

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|--|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1203940F / <i>Space Situation Awareness Operations</i> | Project (Number/Name) 65A037 / <i>Ground Based Optical Sensor System (GBOSS)</i> |
|--|---|--|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|---------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| GBOSS design, development and life extension | Various | Multiple : Colorado Springs, CO | - | 6.656 | May 2018 | 40.643 | Nov 2018 | 69.800 | Dec 2019 | - | | 69.800 | Continuing | Continuing | - |
| GBOSS Technical Mission Analysis | C/CPIF | NASA/JPL: : Pasadena, CA | - | 1.500 | May 2018 | 2.000 | Dec 2018 | - | | - | | - | Continuing | Continuing | - |
| Subtotal | | | - | 8.156 | | 42.643 | | 69.800 | | - | | 69.800 | Continuing | Continuing | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| A&AS | Various | Multiple : TBD | - | 1.177 | May 2018 | 1.570 | May 2019 | 2.000 | Apr 2020 | - | | 2.000 | Continuing | Continuing | - |
| FFRDC | Various | Multiple: TBD : TBD | - | 0.351 | May 2018 | 1.752 | May 2019 | 4.929 | Apr 2020 | - | | 4.929 | Continuing | Continuing | - |
| Other Support | C/CPAF | Various: TBD : TBD | - | 0.000 | | 0.050 | Oct 2018 | 0.100 | Nov 2019 | - | | 0.100 | Continuing | Continuing | - |
| Subtotal | | | - | 1.528 | | 3.372 | | 7.029 | | - | | 7.029 | Continuing | Continuing | N/A |

| | | | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|--|--|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|
| Project Cost Totals | | | - | 9.684 | 46.015 | 76.829 | - | 76.829 | Continuing | Continuing | N/A |

Remarks

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1203940F / <i>Space Situation Awareness Operations</i> | Project (Number/Name) 65A037 / <i>Ground Based Optical Sensor System (GBOSS)</i> |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| <i>GBOSS Phase I Development</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GBOSS TMRR | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GBOSS EMD | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1203940F / <i>Space Situation Awareness Operations</i> | Project (Number/Name) 65A037 / <i>Ground Based Optical Sensor System (GBOSS)</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|---|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>GBOSS Phase I Development</i> | | | | |
| GBOSS TMRR | 4 | 2018 | 1 | 2020 |
| GBOSS EMD | 2 | 2020 | 2 | 2023 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 1206421F / <i>Counterspace Systems</i> |
|---|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|--|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 64.208 | 20.242 | 29.037 | 0.000 | 29.037 | 27.588 | 23.454 | 23.897 | 62.695 | Continuing | Continuing |
| 65A001: <i>Counter Satellite Communications System</i> | - | 55.561 | 11.254 | 19.808 | 0.000 | 19.808 | 18.227 | 13.894 | 14.162 | 52.785 | Continuing | Continuing |
| 65A005: <i>Offensive Counterspace (OCS) C2</i> | - | 6.822 | 7.081 | 7.282 | 0.000 | 7.282 | 7.376 | 7.529 | 7.667 | 7.805 | Continuing | Continuing |
| 65A013: <i>BOUNTY HUNTER</i> | - | 1.825 | 1.907 | 1.947 | 0.000 | 1.947 | 1.985 | 2.031 | 2.068 | 2.105 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

Acquisition Decision Memorandum (ADM) April 24th 2009, directed all capabilities identified in the October 4th 2006, Counter Communications System (CCS) Block 20, Joint Requirements Oversight Council (JROC) approved Capability Development Document (CDD) shall be accomplished as Pre-planned Product Improvement Program (P3I) upgrades to the CCS Block 10. On April 11th 2016, Air Force Space Command (AFSPC) updated ADM adding additional responsibility for CCS Block 10.3.

CCS provides expeditionary, deployable, reversible offensive space control (OCS) effects applicable across the full spectrum of conflict. It prevents adversary Satellite Communications (SATCOM) in Area of Responsibility (AOR) including Command & Control (C2), Early Warning and Propaganda, and hosts Rapid Reaction Capabilities in response to Urgent Needs. This program effort includes architecture engineering and studies, system hardware design and development, software design and integration, and testing and demonstration of capabilities to provide disruption of satellite communications signals.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) is transforming the organization and implementation of space acquisition to an enterprise approach, maximizing innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose capabilities.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver Counterspace weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392F and 1206398F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| | |
|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 1206421F / <i>Counterspace Systems</i> |
|---|---|

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 66.370 | 20.676 | 29.037 | 0.000 | 29.037 |
| Current President's Budget | 64.208 | 20.242 | 29.037 | 0.000 | 29.037 |
| Total Adjustments | -2.162 | -0.434 | 0.000 | 0.000 | 0.000 |
| • Congressional General Reductions | 0.000 | -0.434 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -2.162 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

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|---|--------------------|----------------|----------------|---------------------|---|----------------------|----------------|----------------|---|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 5 | | | | | R-1 Program Element (Number/Name) PE 1206421F / <i>Counterspace Systems</i> | | | | Project (Number/Name) 65A001 / <i>Counter Satellite Communications System</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 65A001: <i>Counter Satellite Communications System</i> | - | 55.561 | 11.254 | 19.808 | 0.000 | 19.808 | 18.227 | 13.894 | 14.162 | 52.785 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

Acquisition Decision Memorandum (ADM) April 24th 2009, directed all capabilities identified in the Oct 4th 2006 CCS Block 20, Joint Requirements Oversight Council (JROC) approved Capability Development Document (CDD) shall be accomplished as Pre-planned Product Improvement Program (P3I) upgrades to the Counter Communications System (CCS) Block 10. On April 11th 2016, Air Force Space Command (AFSPC) A5/A8/A9 signed and updated ADM adding additional responsibility for CCS Block 10.3.

CCS provides expeditionary, deployable, reversible offensive space control (OCS) effects applicable across the full spectrum of conflict. It prevents adversary Satellite Communications (SATCOM) in Area of Responsibility (AOR) including Command & Control (C2), Early Warning and Propaganda, and hosts Rapid Reaction Capabilities in response to Urgent Needs. This program effort includes architecture engineering and studies, system hardware design and development, software design and integration, and testing and demonstration of capabilities to provide disruption of satellite communications signals.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| Title: Counter Communications System (CCS) Pre-planned Product Improvement (P3I) Program | 55.561 | 11.254 | 19.808 |
| Description: Develop, integrate, test and field the CCS P3I program. This is an incremental approach to deliver Block 20 CCS capabilities. | | | |
| FY 2019 Plans: Begin development, integration and testing of increment 3 of Block 10 P3I program CCS Block 10.3. Include additional CCS Block 20 CDD capabilities in CCS Block 10.3, design forward garrison systems, mission techniques, mission specific emulators, and multi-range integration. Begin development planning and risk reduction activities for next generation electronic warfare capabilities. Continue rapid response to implement system resiliency and situational awareness necessary to operate in the contested space domain. Continue program office support and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc. | | | |
| FY 2020 Plans: Continue development, integration and testing of increment 3 CCS Block 10.3. Include additional CCS Block 20 CDD capabilities in CCS Block 10.3, design forward garrison systems, mission techniques, mission specific emulators, and multi-range integration. Continue development planning and risk reduction activities for the next generation electronic warfare capabilities. Continue program office support and other related support activities. Rapidly respond to implement system resiliency and situational | | | |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206421F / <i>Counterspace Systems</i> | Project (Number/Name) 65A001 / <i>Counter Satellite Communications System</i> |

| | | | |
|--|----------------|----------------|----------------|
| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
| awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc. | | | |
| <i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> FY 2020 increased compared to FY 2019 by \$8.554M. Justification for this increase is described above. | | | |
| Accomplishments/Planned Programs Subtotals | 55.561 | 11.254 | 19.808 |

| | | | | | | | | | | | |
|--|----------------|----------------|---------------------|--------------------|----------------------|----------------|----------------|----------------|----------------|-------------------------|-------------------|
| C. Other Program Funding Summary (\$ in Millions) | | | | | | | | | | | |
| Line Item | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| • SPAF 01 Line Item CTRSPC: <i>Counterspace Systems</i> | 22.737 | 0.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | - | - | 0.000 | 22.737 |

Remarks

D. Acquisition Strategy

All contracts in this program element will be awarded using competitive procedures to the maximum extent possible, to upgrade existing capabilities as well as to acquire next generation capabilities through incremental acquisitions.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|---|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206421F / <i>Counterspace Systems</i> | Project (Number/Name) 65A001 / <i>Counter Satellite Communications System</i> |
|--|---|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|---------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Block 10 P3I Development | Various | Various : El Segundo, CA | - | 47.135 | Feb 2018 | 3.815 | Feb 2019 | 12.776 | Feb 2020 | - | | 12.776 | Continuing | Continuing | - |
| Technical Mission Analysis | RO | Aerospace Corp : El Segundo, CA | - | 0.578 | Oct 2017 | 1.095 | Oct 2018 | 0.724 | Oct 2019 | - | | 0.724 | Continuing | Continuing | 11.144 |
| Enterprise Systems Engineering and Integration | C/FFP | AT&T : El Segundo, CA | - | 0.151 | May 2018 | 0.199 | May 2019 | 0.199 | May 2020 | - | | 0.199 | Continuing | Continuing | - |
| Subtotal | | | - | 47.864 | | 5.109 | | 13.699 | | - | | 13.699 | Continuing | Continuing | N/A |

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---------------------------------|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Security | C/CPAF | Mantech : El Segundo, CA | - | 2.138 | Nov 2017 | 2.177 | Nov 2018 | 2.215 | Nov 2019 | - | | 2.215 | Continuing | Continuing | - |
| Miscellaneous Support Services | Various | Various : TBD | - | 0.000 | Nov 2017 | 0.007 | Nov 2018 | 0.008 | Nov 2019 | - | | 0.008 | Continuing | Continuing | - |
| Subtotal | | | - | 2.138 | | 2.184 | | 2.223 | | - | | 2.223 | Continuing | Continuing | N/A |

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Testing Support | MIPR | 25 Space Range Squadron : Peterson AFB, CO | - | 0.006 | Apr 2018 | 0.060 | Oct 2018 | - | | - | | - | 0.000 | 0.066 | - |
| Subtotal | | | - | 0.006 | | 0.060 | | - | | - | | - | 0.000 | 0.066 | N/A |

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| Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force | | | | | | | | | | | | Date: February 2019 | | | |
|--|------------------------|---------------------------------|-------------|----------------|------------|---|--------------|---------------------|-------------|--------------------|---------------|---|------------------|--------------------------|--------------------------|
| Appropriation/Budget Activity 3600 / 5 | | | | | | R-1 Program Element (Number/Name) PE 1206421F / <i>Counterspace Systems</i> | | | | | | Project (Number/Name) 65A001 / <i>Counter Satellite Communications System</i> | | | |
| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | | | |
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | Target Value of Contract |
| FFRDC | RO | Aerospace Corp : El Segundo, CA | - | 0.807 | Oct 2017 | 1.339 | Oct 2018 | 0.759 | Oct 2019 | - | | 0.759 | Continuing | Continuing | - |
| A&AS | Various | Various : El Segundo, CA | - | 4.681 | May 2018 | 2.475 | May 2019 | 3.049 | May 2020 | - | | 3.049 | Continuing | Continuing | - |
| Other Support | Various | Various : El Segundo, CA | - | 0.065 | Oct 2017 | 0.087 | Oct 2018 | 0.078 | Oct 2019 | - | | 0.078 | Continuing | Continuing | - |
| Subtotal | | | - | 5.553 | | 3.901 | | 3.886 | | - | | 3.886 | Continuing | Continuing | N/A |
| | | | Prior Years | FY 2018 | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract | |
| Project Cost Totals | | | - | 55.561 | 11.254 | 19.808 | - | 19.808 | | | | Continuing | Continuing | N/A | |
| Remarks | | | | | | | | | | | | | | | |

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206421F / <i>Counterspace Systems</i> | Project (Number/Name) 65A001 / <i>Counter Satellite Communications System</i> |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|--|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| CCS B10.3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10.2 System Deliveries : #3-16 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10.3 Authority To Proceed (ATP) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10.3. Development | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10.3 System Deliveries #1-4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10.3 Development Test/Operational Test | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10.3 Sustainment | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206421F / <i>Counterspace Systems</i> | Project (Number/Name) 65A001 / <i>Counter Satellite Communications System</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| CCS B10.3 | | | | |
| 10.2 System Deliveries : #3-16 | 3 | 2018 | 4 | 2020 |
| 10.3 Authority To Proceed (ATP) | 2 | 2019 | 2 | 2019 |
| 10.3. Development | 2 | 2019 | 3 | 2022 |
| 10.3 System Deliveries #1-4 | 4 | 2021 | 4 | 2021 |
| 10.3 Development Test/Operational Test | 3 | 2022 | 1 | 2023 |
| 10.3 Sustainment | 1 | 2023 | 4 | 2024 |

Note
For CCS B10.2, 14 systems delivered plus 2 trainers.

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|---|--------------------|----------------|----------------|---------------------|---|----------------------|----------------|----------------|---|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 5 | | | | | R-1 Program Element (Number/Name) PE 1206421F / <i>Counterspace Systems</i> | | | | Project (Number/Name) 65A005 / <i>Offensive Counterspace (OCS) C2</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 65A005: <i>Offensive Counterspace (OCS) C2</i> | - | 6.822 | 7.081 | 7.282 | 0.000 | 7.282 | 7.376 | 7.529 | 7.667 | 7.805 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

This effort supports the evolution of command and control (C2) and mission planning capabilities in support of the fielding and employment of Counterspace Systems. It provides for the integration and upgrade of collaborative tools to link deployable counterspace systems with Joint Warfighting C2 systems and to enable integrated planning and execution of the counterspace mission. Upgraded capabilities will be integrated into current and future command and control systems. This program will leverage the Joint Execution and Tasking System for Space (JETSS) effort in C2 for future space control and counterspace mission capabilities. Requirements for this program are derived from AFSPC prioritized requirements, in accordance with AFSPC 63-104.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| Title: Joint Execution and Tasking System for Space (JETSS) | 6.822 | 7.081 | 7.282 |
| Description: Evolve with upgrades the counterspace mission planning and C2 capability to support counterspace systems space control warfighter activities. | | | |
| FY 2019 Plans: Begin Spiral 6 development of higher protection level to support multiple classification levels and risk reduction efforts to support C2 initiatives for various programs. | | | |
| Continue program office support and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc. | | | |
| FY 2020 Plans: Continue Spiral 6 development of higher protection level to support multiple classification levels and risk reduction efforts to support C2 initiatives for various programs. | | | |
| Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. activities may include, but are not limited to, program office support, studies, technical analysis, prototyping, etc. | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 increased compared to FY 2019 by \$0.201M. Justification for this increase is described in plans above. | | | |
| Accomplishments/Planned Programs Subtotals | 6.822 | 7.081 | 7.282 |

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force Date: February 2019

| | | |
|--|---|---|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206421F / <i>Counterspace Systems</i> | Project (Number/Name) 65A005 / <i>Offensive Counterspace (OCS) C2</i> |
|--|---|---|

C. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

-

D. Acquisition Strategy

All contracts will be awarded using competitive procedures to the maximum extent possible to acquire next generation capabilities through incremental acquisitions.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|---|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206421F / <i>Counterspace Systems</i> | Project (Number/Name) 65A005 / <i>Offensive Counterspace (OCS) C2</i> |
|--|---|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|------------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Develop Counterspace Planning and C2 System (JETSS) | C/CPAF | General Dynamics : Santa Clara, CA | - | 4.886 | Dec 2017 | 5.014 | Aug 2019 | 5.258 | Aug 2020 | - | | 5.258 | Continuing | Continuing | - |
| Counterspace Architecture Development | C/CPFF | NGMS : Redondo Beach, CA | - | 0.649 | Jun 2018 | 0.650 | Jun 2019 | 0.668 | Jun 2020 | - | | 0.668 | Continuing | Continuing | - |
| Technical Mission Analysis | RO | Aerospace : VAFB, CA | - | 0.115 | Oct 2017 | 0.054 | Oct 2018 | 0.056 | Oct 2019 | - | | 0.056 | Continuing | Continuing | - |
| Subtotal | | | - | 5.650 | | 5.718 | | 5.982 | | - | | 5.982 | Continuing | Continuing | N/A |

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---------------------------------|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Civilian Support | RO | SMC : LAAFB, CA | - | 0.170 | May 2018 | - | | - | | - | | - | 0.000 | 0.170 | 0.000 |
| Subtotal | | | - | 0.170 | | - | | - | | - | | - | 0.000 | 0.170 | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| A&AS | C/CPAF | Various : TBD | - | 0.822 | Oct 2017 | 1.211 | Oct 2018 | 1.143 | Oct 2019 | - | | 1.143 | Continuing | Continuing | - |
| Other Support | C/Various | Various : TBD | - | 0.180 | Oct 2017 | 0.152 | Oct 2018 | 0.157 | Oct 2019 | - | | 0.157 | Continuing | Continuing | - |
| Subtotal | | | - | 1.002 | | 1.363 | | 1.300 | | - | | 1.300 | Continuing | Continuing | N/A |

| | | | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|--|--|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|
| Project Cost Totals | | | - | 6.822 | 7.081 | 7.282 | - | 7.282 | Continuing | Continuing | N/A |

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|---|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206421F / <i>Counterspace Systems</i> | Project (Number/Name) 65A005 / <i>Offensive Counterspace (OCS) C2</i> |
|--|---|---|

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
|--------------------------|--|
| JETSS | |
| C2 Spiral #6 Development | |
| C2 Spiral #6 Test | |
| C2 Spiral #6 Delivery | |

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|--|---|---|
| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206421F / <i>Counterspace Systems</i> | Project (Number/Name) 65A005 / <i>Offensive Counterspace (OCS) C2</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--------------------------|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| JETSS | | | | |
| C2 Spiral #6 Development | 1 | 2019 | 4 | 2023 |
| C2 Spiral #6 Test | 3 | 2022 | 3 | 2022 |
| C2 Spiral #6 Delivery | 4 | 2023 | 4 | 2023 |

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|---|--------------------|----------------|----------------|---------------------|---|----------------------|----------------|----------------|---|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 5 | | | | | R-1 Program Element (Number/Name) PE 1206421F / <i>Counterspace Systems</i> | | | | Project (Number/Name) 65A013 / <i>BOUNTY HUNTER</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 65A013: <i>BOUNTY HUNTER</i> | - | 1.825 | 1.907 | 1.947 | 0.000 | 1.947 | 1.985 | 2.031 | 2.068 | 2.105 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

Bounty Hunter (BH) supports the Defensive Space Control of US systems in a specific AOR and provides the capacity to prevent effective adversary use of Command, Control, Communications, Computers, and Intelligence (C4I). Continuing yearly spiral development is needed to meet new user needs in an ever changing threat environment.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| Title: Bounty Hunter | 1.825 | 1.907 | 1.947 |
| Description: Develop new capabilities for the Bounty Hunter program to maintain operational capability. Specific accomplishments are classified. | | | |
| FY 2019 Plans: Continue R&D for obsolescence challenges in component replace for new system deliveries. Continue EMI upgrade integration. Begin new UHF band capability integration requested on AFSPC 1067 | | | |
| FY 2020 Plans: Complete development and integration of UHF capability. Resolve any new tech obsolescence HW ad SW challenges with new system component purchases for additional new system delivery to a new AOR. Prepare R&D plan for new total system upgrade to BH 3.0 to allow for system component consolidation and consideration for remote operation. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc. | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: FY2020 increased compared to FY2019 by \$0.040M. Increase supports additional MITRE STE to support BH 3.0 future developmental efforts. | | | |
| Accomplishments/Planned Programs Subtotals | 1.825 | 1.907 | 1.947 |

C. Other Program Funding Summary (\$ in Millions)

| Line Item | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|--|----------------|----------------|---------------------|--------------------|----------------------|----------------|----------------|----------------|----------------|-------------------------|-------------------|
| • SPAF 01 CTRSPC: <i>Counterspace Systems</i> | 6.061 | 1.121 | - | - | - | - | - | - | - | 0.000 | 7.182 |

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|---|----------------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | Date: February 2019 |
|---|----------------------------|

| | | |
|--|---|---|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206421F / <i>Counterspace Systems</i> | Project (Number/Name) 65A013 / <i>BOUNTY HUNTER</i> |
|--|---|---|

C. Other Program Funding Summary (\$ in Millions)

| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> <u>Base</u> | <u>FY 2020</u> <u>OCO</u> | <u>FY 2020</u> <u>Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To</u> <u>Complete</u> | <u>Total Cost</u> |
|------------------|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|
|------------------|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|

Remarks
BH was established as a new start in FY16 when decision was made to begin efforts to bring BH online as a Program of Record having been initiated as a JCTD project in response to a JUON in 2010.

D. Acquisition Strategy

Contracts funded for this program shall be awarded to the MITRE Federally Funded Research and Development Center (FFRDC).

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|---|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206421F / <i>Counterspace Systems</i> | Project (Number/Name) 65A013 / <i>BOUNTY HUNTER</i> |
|--|---|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Bounty Hunter Spiral Development | MIPR | MITRE : Colorado Springs, CO | - | 1.825 | Oct 2017 | 1.907 | Oct 2017 | 1.947 | Sep 2019 | - | | 1.947 | Continuing | Continuing | - |
| Subtotal | | | - | 1.825 | | 1.907 | | 1.947 | | - | | 1.947 | Continuing | Continuing | N/A |

Remarks
Bounty Hunter program was a new start in FY 2016.

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| BOUNTY HUNTER SPIRAL DEVELOPMENT | MIPR | Not specified : TBD | - | - | | - | | - | | - | | - | Continuing | Continuing | - |
| Subtotal | | | - | - | | - | | - | | - | | - | Continuing | Continuing | N/A |

| | | | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|--|--|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|
| Project Cost Totals | | | - | 1.825 | 1.907 | 1.947 | - | 1.947 | Continuing | Continuing | N/A |

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|--|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206421F / Counterspace Systems | Project (Number/Name) 65A013 / BOUNTY HUNTER |
|--|--|--|

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|--|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| BOUNTY HUNTER | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Bounty Hunter Development Spiral 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Spiral # 3 Delivery | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bounty Hunter Development Spiral 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Spiral #4 Delivery | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bounty Hunter Development Spiral 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Spiral #5 Delivery | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bounty Hunter Development Spiral 6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Spiral #6 Delivery | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bounty Hunter Development Spiral 7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Spiral #7 Delivery | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|---|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206421F / <i>Counterspace Systems</i> | Project (Number/Name) 65A013 / <i>BOUNTY HUNTER</i> |
|--|---|---|

Schedule Details

| Events by Sub Project | Start | | End | |
|------------------------------------|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>BOUNTY HUNTER</i> | | | | |
| Bounty Hunter Development Spiral 3 | 1 | 2018 | 3 | 2018 |
| Spiral # 3 Delivery | 4 | 2018 | 4 | 2018 |
| Bounty Hunter Development Spiral 4 | 1 | 2019 | 3 | 2019 |
| Spiral #4 Delivery | 4 | 2019 | 4 | 2019 |
| Bounty Hunter Development Spiral 5 | 1 | 2020 | 3 | 2020 |
| Spiral #5 Delivery | 4 | 2020 | 4 | 2020 |
| Bounty Hunter Development Spiral 6 | 1 | 2021 | 3 | 2021 |
| Spiral #6 Delivery | 4 | 2021 | 4 | 2021 |
| Bounty Hunter Development Spiral 7 | 1 | 2022 | 3 | 2022 |
| Spiral #7 Delivery | 4 | 2022 | 4 | 2022 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 1206422F / <i>Weather System Follow-on</i> |
|---|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 0.000 | 0.000 | 2.237 | 0.000 | 2.237 | 2.527 | 2.583 | 1.413 | 0.000 | Continuing | Continuing |
| 65A038: <i>SSA Environmental Monitoring</i> | - | 0.000 | 0.000 | 2.237 | 0.000 | 2.237 | 2.527 | 2.583 | 1.413 | 0.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

Note
 Space Situational Awareness Environment Monitoring (SSAEM) project is a continuation of the Air Force technology demonstration of environmental monitoring sensors on the NOAA COSMIC-2 mission. SSAEM funding was transferred starting in FY 2020 from Project 644289, Weather Satellite Follow-On, to Project 65A038 in PE 1206422F, and was funded in Prior Years through PE 0604425F and 1206425F, Space Situational Awareness Systems.

A. Mission Description and Budget Item Justification

The Space Situational Awareness Environmental Monitoring (SSAEM) program is a non-ACAT, Class D technology demonstration project to support international Constellation Observing System for Meteorology, Ionosphere and Climate 2 (COSMIC-2) mission. The SSAEM program provides the acquisition, development and launch/on-orbit support of 18 space/terrestrial weather sensors to COSMIC-2 partnership in coordination with National Oceanic and Atmospheric Administration (NOAA) and Taiwan's National Space Organization (NSPO). COSMIC-2 is launching six satellites in an equatorial, Low Earth Orbit (LEO) with 3 SSAEM sensors in each spacecraft by FY 2019. The sensor types are; Tri-Global Navigation Satellite System (Tri-GNSS) Radio occultation System (TGRS), Ion Velocity Meter (IVM) and Radio Frequency Beacon (RFB). The SSAEM sensors will address three distinct Joint Requirement Oversight Committee (JROC)-approved Category A weather gaps, specifically Gap #4 (Ionospheric Density), Gap #7 (Equatorial Ionospheric Scintillation) and Gap #12 (Electric Field), to provide additional space meteorological data to improve forecast capabilities and improve warfighter navigation/communication capabilities over the next five years.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) is transforming the organization and implementation of space acquisition to an enterprise approach, maximizing innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose capabilities.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver WSF weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392F and 1206398F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 1206422F / <i>Weather System Follow-on</i> |
|---|---|

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Current President's Budget | 0.000 | 0.000 | 2.237 | 0.000 | 2.237 |
| Total Adjustments | 0.000 | 0.000 | 2.237 | 0.000 | 2.237 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 2.237 | 0.000 | 2.237 |

Change Summary Explanation

FY 2020: \$2.237M transferred from PE 1206422F, Project 644289, Weather System Follow-On.

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| Title: Space Situational Awareness Environmental Monitoring (SSAEM) | - | - | 2.237 |
| Description: The SSAEM program is a non-ACAT, Class D technology demonstration project to support international Constellation Observing System for Meteorology, Ionosphere and Climate 2 (COSMIC-2) mission. The SSAEM program provides the acquisition, development and launch/on-orbit support of 18 space/terrestrial weather sensors to COSMIC-2 partnership in coordination with National Oceanic and Atmospheric Administration (NOAA) and Taiwan's National Space Organization (NSPO). COSMIC-2 is launching six satellites in an equatorial, Low Earth Orbit (LEO) with 3 SSAEM sensors in each spacecraft by FY19. The sensor types are; Tri-GNSS Radio occultation System (TGRS), Ion Velocity Meter (IVM) and Radio Frequency Beacon (RFB). The SSAEM sensors will address three distinct Joint Requirement Oversight Committee (JROC)-approved Category A weather gaps, specifically Gap 4(Ionospheric Density), 7 (Equatorial Ionospheric Scintillation) and 12 (Electric Field), to provide additional space meteorological data to improve forecast capabilities and improve warfighter navigation/communication capabilities over the next five years. | | | |
| FY 2020 Plans: Will continue on-orbit support of SSAEM sensors onboard COSMIC-2 once it reaches proper orbit, and initiates on-orbit checkout, as well as sensor calibration/validation (cal/val). Once the sensors complete on-orbit checkout, and successful cal/val, the | | | |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| | |
|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 1206422F / <i>Weather System Follow-on</i> |
|---|---|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|---------|---------|---------|
| <p>program will provide continued remote sensing of space weather coverage until the satellites reach their designed mission End of Life (EoL). Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, prototyping, etc.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY2020 increased compared to FY2019 by \$2.237M. Justification for this increase is described in plans above.</p> | | | |
| Accomplishments/Planned Programs Subtotals | - | - | 2.237 |

D. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

E. Acquisition Strategy

SSAEM sensors support contract will be a sole-source contract to University Corporation Atmospheric Research (UCAR) due to their expertise in radio occultation and space weather monitoring for SSAEM sensors. The Justification & Approval (J&A) was approved in Jun 18, enabling Request for Proposal to be released in 1 Aug 18. The contract is slated to be awarded in 2Q FY 2019 for a 5-year support contract for the launch/checkout, cal/val and on-orbit activities.

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|--|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206422F / <i>Weather System Follow-on</i> | Project (Number/Name) 65A038 / <i>SSA Environmental Monitoring</i> |
|--|---|--|

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
|------------------------------------|--|
| Space Situational Awareness | |
| Environmental Monitoring | |
| SSAEM Sensors Cal/Val | |
| On Orbit Activities | |

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|--|---|--|
| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206422F / <i>Weather System Follow-on</i> | Project (Number/Name) 65A038 / <i>SSA Environmental Monitoring</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Space Situational Awareness Environmental Monitoring</i> | | | | |
| SSAEM Sensors Cal/Val | 3 | 2019 | 1 | 2021 |
| On Orbit Activities | 2 | 2021 | 4 | 2023 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|--|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 1206425F / <i>Space Situation Awareness Systems</i> |
|---|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | 22.429 | 47.580 | 134.464 | 412.894 | 0.000 | 412.894 | 173.131 | 310.602 | 75.533 | 57.297 | 0.000 | 1,233.930 |
| 65A006: <i>Space Based Space Surveillance</i> | 22.429 | 47.580 | 134.464 | 412.894 | 0.000 | 412.894 | 173.131 | 310.602 | 75.533 | 57.297 | 0.000 | 1,233.930 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | - | - |

Program MDAP/MAIS Code: 328

A. Mission Description and Budget Item Justification

The Space-Based Space Surveillance (SBSS) Block 10 satellite was launched September 2010 with a design life through 2018 and an extended operational capability through 2020. The SBSS Follow-On (SBSS FO) program will develop and deliver a system to continue providing space object surveillance from space post SBSS Block 10 End-of-Life. AFSPC and NRO have signed a Memorandum of Agreement partnering SBSS FO with an NRO program based on overlapping requirements. The new partner program is called SILENTBARKER. SILENTBARKER requirements are based on a Statement of Capabilities and upon the current Space Situational Awareness (SSA) Initial Capabilities Document architectural requirements focused on protecting High Value Assets. SILENTBARKER will provide the capability to search, detect, and track objects from a space-based sensor for timely custody and event detection. Surveillance from space augments and overcomes existing ground sensor limitations with timely 24-hour above-the-weather collection of satellite metric data only possible with a space-based sensor and then communicates its findings to the Combined Space Operations Center (CSpOC), National Space Defense Center (NSDC), and other classified users. This program element includes efforts related to SILENTBARKER, its integration into the broader space superiority architecture, and analysis and experimentation to ensure space-based space surveillance capabilities against the evolving threat.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) is transforming the organization and implementation of space acquisition to an enterprise approach, maximizing innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose capabilities.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392F and 1206398F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 1206425F / <i>Space Situation Awareness Systems</i> |
|---|--|

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 48.448 | 134.463 | 122.698 | 0.000 | 122.698 |
| Current President's Budget | 47.580 | 134.464 | 412.894 | 0.000 | 412.894 |
| Total Adjustments | -0.868 | 0.001 | 290.196 | 0.000 | 290.196 |
| • Congressional General Reductions | -1.201 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 2.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -1.667 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.001 | 290.196 | 0.000 | 290.196 |

Change Summary Explanation

FY 2018: \$2.000M reprogramming for environmental monitoring effort.

FY 2020: \$290.196M increase for acquisition of increased coverage of deep space belt and to update mission data processing and scheduling for ground segment to leverage full capability of National Space Defense Center (NSDC) SSA and Indications and Warnings (I&W) missions to track and target high interest objects.

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| Title: SBSS Follow-On (SBSS FO) Design & Development | 47.580 | 134.464 | 412.894 |
| Description: Performs space based SSA analysis, research, and development for the SILENTBARKER system in partnership with SILENTBARKER. | | | |
| FY 2019 Plans: | | | |
| Continue SILENTBARKER partner development in the Engineering and Manufacturing Development (EMD) phase. Prepare for and conduct Preliminary Design Review (PDR). Continue development in EMD phase in preparation for Critical Design Review in FY 2020. Continue analyses of associated sensors and mission data processing in order to develop architectures and acquisition approaches for delivery of critical space-based space surveillance data from SILENTBARKER, hosted payloads, and other systems to warfighting decision makers. Continue rapid response to implement system resiliency and situational awareness | | | |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 1206425F / <i>Space Situation Awareness Systems</i> |
|---|--|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, integration, technical analysis, prototyping, demonstrations, etc. | | | |
| <i>FY 2020 Plans:</i> Complete SILENTBARKER partner development in EMD phase and transition to Production phase. Prepare for and conduct Critical Design Review. Initiate acquisition of capabilities to expand SILENTBARKER coverage in deep space belt. Implement ground mission data processing and scheduling acquisition approach. Identify requirements and technology enhancements to ensure space-based space surveillance capabilities against the evolving threat for future upgrades, extensions, and augmentations through analysis, prototyping, and experimentation. Rapidly respond to and implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to, program office support, studies, integration, technical analysis, experimentation, prototyping, demonstrations, etc. and leverages opportunities for commercial and international partnerships. | | | |
| <i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> FY 2020 increased compared to FY 2019 by \$278.430M. Justification is expanded capabilities and update of mission data processing and scheduling for ground segment to leverage full capability of National Space Defense Center SSA and Indications and Warnings missions to track and target high interest objects. | | | |
| Accomplishments/Planned Programs Subtotals | 47.580 | 134.464 | 412.894 |

D. Other Program Funding Summary (\$ in Millions)
N/A

Remarks

E. Acquisition Strategy
The Acquisition Strategy was approved to minimize the space-based SSA gap post-SBSS Block 10. SILENTBARKER anticipates Initial Launch Capability in FY 2022. The SBSS FO Materiel Development Decision was approved by the Milestone Decision Authority (MDA) on April 5, 2016. The Acquisition Strategy Panel was completed with the MDA on August 29, 2016. To satisfy the SSA architecture needs, the SBSS FO program requirements combined with an NRO program and were updated in the December 2017 SILENTBARKER Statement of Capabilities. The SBSS FO program remains an Air Force program, but will leverage NRO processes to fulfill SBSS FO space segment and telemetry, tracking, and commanding (TT&C) program segments in order to further National Security Space objectives. Mutual investment for the non-recurring engineering (NRE) cost enables the potential for a larger initial constellation buy and lower unit costs. The Air Force and NRO will determine the approach to meet mission processing requirements, develop the ground architecture, and initiate acquisition of extended capabilities in 2020.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 1206425F / <i>Space Situation Awareness Systems</i> |
|---|--|

F. Performance Metrics
Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206425F / <i>Space Situation Awareness Systems</i> | Project (Number/Name) 65A006 / <i>Space Based Space Surveillance Systems</i> |
|--|--|--|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| SBSS Follow On Prime Development | MIPR | TBD : TBD | 14.110 | 39.462 | Dec 2017 | 118.618 | Oct 2018 | 394.931 | Oct 2019 | - | | 394.931 | 236.476 | 803.597 | - |
| Technical Mission Analysis | Various | Various : Various, CA | 1.446 | 0.796 | Oct 2017 | 0.820 | Oct 2018 | 1.841 | Oct 2019 | - | | 1.841 | 3.465 | 8.368 | - |
| Enterprise SE&I | Various | Not specified. : TBD | 1.160 | 1.443 | Oct 2017 | 1.000 | Oct 2018 | 1.360 | Oct 2019 | - | | 1.360 | 0.000 | 4.963 | - |
| Subtotal | | | 16.716 | 41.701 | | 120.438 | | 398.132 | | - | | 398.132 | 239.941 | 816.928 | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|-----------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| FFRDC | C/FFP | Aerospace Corp. : Los Angeles, CA | 0.784 | 0.398 | Oct 2017 | 0.819 | Oct 2018 | 1.842 | Oct 2019 | - | | 1.842 | 3.465 | 7.308 | - |
| A&AS | Various | Various : CA | 4.839 | 5.381 | Oct 2017 | 13.006 | Oct 2018 | 11.820 | Oct 2019 | - | | 11.820 | 39.687 | 74.733 | - |
| Other Support | Various | Various : TBD | 0.090 | 0.100 | Oct 2017 | 0.201 | Oct 2018 | 1.100 | Oct 2019 | - | | 1.100 | 0.400 | 1.891 | - |
| Subtotal | | | 5.713 | 5.879 | | 14.026 | | 14.762 | | - | | 14.762 | 43.552 | 83.932 | N/A |

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract | |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|-----|
| Project Cost Totals | | 22.429 | 47.580 | 134.464 | 412.894 | - | 412.894 | 283.493 | 900.860 | N/A |

Remarks

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206425F / <i>Space Situation Awareness Systems</i> | Project (Number/Name) 65A006 / <i>Space Based Space Surveillance</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|---|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>SBSS Follow On</i> | | | | |
| Acquisition Strategy, RFP Development, Source Selection | 1 | 2018 | 2 | 2018 |
| Contract Award | 1 | 2018 | 1 | 2018 |
| Technology Development, Engineering and Manufacturing Development, Production | 2 | 2018 | 3 | 2022 |
| Preliminary Design Review (PDR) | 4 | 2019 | 4 | 2019 |
| Milestone B | 2 | 2018 | 2 | 2018 |
| Critical Design Review (CDR) | 4 | 2020 | 4 | 2020 |
| Available for Launch | 4 | 2022 | 4 | 2022 |
| <i>SBSS Follow On Expanded Coverage</i> | | | | |
| Acquisition Strategy, RFP Development, Technology Evaluation | 4 | 2019 | 2 | 2020 |
| Contract Award | 2 | 2020 | 2 | 2020 |
| Technology Development, Engineering and Manufacturing Development, Production | 3 | 2020 | 4 | 2024 |
| Critical Design Review | 4 | 2021 | 4 | 2021 |
| Available for Launch | 4 | 2024 | 4 | 2024 |

Note

Acq Strategy, RFP Dev and Source Selection completed in 1QFY2017, but changed to 1QFY2018 due to data entry system limitations. Event dates are aligned with SILENTBARKER program threshold schedule.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 1206426F / <i>Space Fence</i> |
|---|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | 583.398 | 34.022 | 19.425 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 636.845 |
| 65A009: <i>Space Fence</i> | 583.398 | 34.022 | 19.425 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 636.845 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | - | - |

Program MDAP/MAIS Code: 438

A. Mission Description and Budget Item Justification

The Space Fence effort develops a system of ground-based sensors to improve upon the former Air Force Space Surveillance System (AFSSS), a Very High Frequency radar operational from 1961 to 2013. The Space Fence provides a more accurate and timely detection capability of smaller orbiting objects, primarily in low-earth orbit (LEO). The system uses higher frequency S-band radars at globally dispersed sites. As a result, it greatly expands the uncued detection and tracking capacity of the Space Surveillance Network, from around 20,000 to 100,000+ objects, while working in concert with other network sensors. Space Fence Radar Site-1 satisfies Initial Operational Capability (IOC) requirement and Radar Site-2 will satisfy Full Operational Capability (FOC) requirements and close the Space Situational Awareness (SSA) LEO gap for discovery and custody/tracking, and synchronize the Site-2 array size to match Site-1 to satisfy resiliency and SSA Geosynchronous Earth Orbit (GEO) sensitivity requirements. Requirements are identified in the June 2012 approved Space Fence Capabilities Development Document (CDD).

In the FY 2019 budget, Space Fence received a Congressional rescission of \$8.000M. The correct total for FY 2018 is \$26.022M

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) is transforming the organization and implementation of space acquisition to an enterprise approach, maximizing innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose capabilities.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver the Space Fence weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392F and 1206398F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 1206426F / <i>Space Fence</i> |
|---|--|

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 35.937 | 20.215 | 0.000 | 0.000 | 0.000 |
| Current President's Budget | 34.022 | 19.425 | 0.000 | 0.000 | 0.000 |
| Total Adjustments | -1.915 | -0.790 | 0.000 | 0.000 | 0.000 |
| • Congressional General Reductions | -0.665 | -0.790 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -1.250 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Change Summary Explanation

In the FY 2019 budget, Space Fence received a Congressional rescission of \$8.000M. The correct total for FY 2018 is \$26.022M

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
|---|----------------|----------------|----------------|

| | | | |
|--|--------|--------|-------|
| <p>Title: Space Fence</p> <p>Description: Develops S-band SSA radar system to provide detection and tracking capability of objects in Low Earth Orbit.</p> <p>FY 2019 Plans: Conduct weapon system enhancement development. Conduct Developmental Test Readiness Review (DTRR) to confirm and certify readiness to enter Developmental Test and Evaluation (DT&E). Complete 60 day Cyber Security Control Assessment. Obtain Authorization to Connect (ATC) from the Army for the Space Fence System. Complete government DT&E. Obtain Authority to Operate (ATO). Enter into and complete dedicated Initial Operational Test and Evaluation (IOT&E). Conduct Trial Period. Receive certified/verified technical orders and manuals from Original Equipment Manufacturer (OEM). Continue organic depot maintenance activation planning to execute turnover of hardware and software depot maintenance support in mid FY 2021. Complete Functional Configuration Audit (FCA) and Physical Configuration Audit (PCA). Complete government material inspection and receipt of Sensor Site 1 (SS1) and the Space Fence Operations Center (SOC). Continue preparations for the second radar site, including studies, investigations, and site surveys in support of FOC. Rapidly respond to and implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to, program office support, studies, technical analysis, prototyping, etc. Complete commissioning of facility infrastructure and validation of facility requirements. Complete formal on-site contractor test of the system at the Kwajalein Atoll, Marshall Islands and the SOC at</p> | 34.022 | 19.425 | 0.000 |
|--|--------|--------|-------|

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 1206426F / <i>Space Fence</i> |
|---|--|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| the Reagan Test Site Operations Center-Huntsville (ROC-H). Continue program office support and other related support activities that may include, but are not limited to, studies, technical analysis, prototyping, etc. FY 2020 Plans: N/A FY 2019 to FY 2020 Increase/Decrease Statement: N/A | | | |
| Accomplishments/Planned Programs Subtotals | 34.022 | 19.425 | 0.000 |

D. Other Program Funding Summary (\$ in Millions)

| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> <u>Base</u> | <u>FY 2020</u> <u>OCO</u> | <u>FY 2020</u> <u>Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To</u> <u>Complete</u> | <u>Total Cost</u> |
|--------------------------------------|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|
| • SPAF 01 SPCFNC: <i>space fence</i> | - | 46.361 | 71.784 | - | 71.784 | 11.291 | - | - | - | 0.000 | 129.436 |

Remarks

E. Acquisition Strategy
 A single Engineering Manufacturing and Development (EMD) Production and Deployment contract was awarded on 2 June 2014 to Lockheed Martin Mission Systems and Training. The contract will take the contractor through Critical Design Review (CDR), fabrication, integration, test, production and deployment, with up to two years of Interim Contractor Support (ICS). The program will utilize a two increment approach. Increment 1/Initial Operational Capability (IOC) will consist of successful operations at the first radar site located on the Kwajalein Atoll and the Space Fence Operations Center (SOC) at Reagan Operations Center-Huntsville, AL (ROC-H). Increment 2 (contract option)/FOC will include completion of the second radar at a location to be determined pending a separate Memorandum of Agreement (MOA) decision approval and negotiations with the proposed host nation.

F. Performance Metrics
 Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|---|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206426F / <i>Space Fence</i> | Project (Number/Name) 65A009 / <i>Space Fence</i> |
|--|--|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|--|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Space Fence Development | C/FPIF | Lockheed Martin : Moorestown, NJ | 522.697 | 24.269 | Aug 2018 | 14.363 | Dec 2018 | - | | - | | - | 0.000 | 561.329 | 911.115 |
| Various (Independent Program Assessment, site survey, software, Site Activation Task Force (SATAF), Space Fence Operations Center (SOC)) | Various | Various : Various | 17.423 | 1.501 | Nov 2017 | 0.865 | Oct 2018 | - | | - | | - | 0.000 | 19.789 | - |
| Space Fence Design Oversight and Management | SS/FP | MIT Lincoln Laboratory : Lexington, MA | 2.788 | 0.480 | Dec 2017 | 0.150 | Jan 2019 | - | | - | | - | 0.000 | 3.418 | - |
| Subtotal | | | 542.908 | 26.250 | | 15.378 | | - | | - | | - | 0.000 | 584.536 | N/A |

Remarks
 Prior to FY 2015 all funds were executed and reported in PE 0604425F (Space Situational Awareness Systems)
 Product Development: \$774.994M

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|---|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Test - 96th Cyberspace Test Group (CTG) | PO | 96th CTG : Eglin AFB, FL | 4.524 | 2.365 | Dec 2017 | 0.126 | Mar 2019 | - | | - | | - | 0.000 | 7.015 | - |
| Test - Joint Interoperability Test Command | MIPR | Joint Interoperability Test Command : Fort Huachuca, AZ | 0.113 | 0.185 | Jan 2018 | 0.065 | Feb 2019 | - | | - | | - | 0.000 | 0.363 | - |
| Subtotal | | | 4.637 | 2.550 | | 0.191 | | - | | - | | - | 0.000 | 7.378 | N/A |

Remarks
 Prior to FY 2015 all funds were executed and reported in PE 0604425F (Space Situational Awareness Systems)
 Test and Evaluation: \$1.366M

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|---|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206426F / <i>Space Fence</i> | Project (Number/Name) 65A009 / <i>Space Fence</i> |
|--|--|---|

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| A&AS | Various | Various : Various | 18.041 | 2.087 | Oct 2017 | 2.586 | Jan 2019 | - | | - | | - | 0.000 | 22.714 | - |
| FFRDC | SS/FP | Various : Various | 17.812 | 3.135 | Nov 2017 | 1.270 | Dec 2018 | - | | - | | - | 0.000 | 22.217 | - |
| Subtotal | | | 35.853 | 5.222 | | 3.856 | | - | | - | | - | 0.000 | 44.931 | N/A |

Remarks
Prior to FY 2015 all funds were executed and reported in PE 0604425F (Space Situational Awareness Systems)
Management Services: \$68.683M

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|
| Project Cost Totals | 583.398 | 34.022 | 19.425 | - | - | - | 0.000 | 636.845 | N/A |

Remarks
FINANCIAL PERFORMANCE: Space Fence is evaluated against traditional Research and Development (R&D) program expenditure benchmarks. Unlike many traditional R&D programs, however, the Space Fence System Engineering Manufacturing and Development contract is an FPIF contract with performance based payments. 11.3% of the incurred costs are withheld until the end of the contract, when they are liquidated. Mandatory funding obligations and payment withholds will cause the program to lag traditional expenditure benchmarks, painting an inaccurate portrait of overall program health.

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|---|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206426F / <i>Space Fence</i> | Project (Number/Name) 65A009 / <i>Space Fence</i> |
|--|--|---|

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|--|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
|--|--|
| <i>Space Fence</i> | |
| Increment 1 EMD | |
| Development Test and Evaluation | |
| Initial Operational Test and Evaluation | |
| Initial Operational Capability (IOC) Increment 1 | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206426F / <i>Space Fence</i> | Project (Number/Name) 65A009 / <i>Space Fence</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Space Fence</i> | | | | |
| Increment 1 EMD | 1 | 2018 | 4 | 2019 |
| Development Test and Evaluation | 2 | 2019 | 3 | 2019 |
| Initial Operational Test and Evaluation | 3 | 2019 | 3 | 2019 |
| Initial Operational Capability (IOC) Increment 1 | 4 | 2019 | 4 | 2019 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 1206431F / <i>Advanced EHF MILSATCOM (SPACE)</i> |
|---|---|

| COST (\$ in Millions) | Prior Years ⁽⁺⁾ | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|----------------------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | 458.323 | 134.775 | 144.753 | 117.290 | 0.000 | 117.290 | 113.469 | 56.286 | 15.015 | 15.285 | Continuing | Continuing |
| 657104: <i>MILSATCOM Space Modernization Initiative (SMI)</i> | 0.000 | 134.775 | 144.753 | 117.290 | 0.000 | 117.290 | 113.469 | 56.286 | 15.015 | 15.285 | Continuing | Continuing |

Program MDAP/MAIS Code: 261

⁽⁺⁾ The sum of all Prior Years is \$458.323 million less than the represented total due to several projects ending

Note

The total FY 2018 funding for PE 1206531F is \$134.775 million. However, due to an accounting error, the FY 2018 funding for Project 657104, MILSATCOM SMI, shown above is incorrect. The correct funding for Project 657104 is \$130.275 million. The remaining FY 2018 \$4.500 million resides in Project 657103, Advanced MILSATCOM.

A. Mission Description and Budget Item Justification

The Space Modernization Initiative (SMI) strategy is to evolve current and future Protected MILSATCOM systems, sustain the existing AEHF system capability and develop a more affordable and resilient MILSATCOM enterprise capable of meeting near term and emerging MILSATCOM requirements. A significant thrust for this initiative is to demonstrate technologies and Concepts of Operations (CONOPS) that lead to a future Protected Anti-Jam Tactical SATCOM (PATS) capability that provides tactical-level MILSATCOM users protected, anti-jam satellite communications while operating in a contested environment. PATS will provide tactical users significantly higher data rates than AEHF and a security architecture that enables forward deployed users to have protected satellite communications in scenarios where AEHF terminals cannot be deployed. Under this construct the SMI will: 1) Reduce parts/obsolescence risk to AEHF space vehicles, 2) Continue the Capabilities Insertion Program (CIP) to enhance the current AEHF constellation and Protected Communications performance, and improve system operational resiliency, and 3) Invest in technologies and demonstrations (e.g. Protected Tactical Service Field Demonstration) that enable the future Protected Tactical Enterprise Service and SATCOM programs by continued development of the Protected Tactical Waveform (PTW) technologies, maturing the Protected Tactical Testbed, and demonstrating resilient and affordable wideband protected technologies and CONOPS.

The FY 2020 funding request was reduced by \$5.388 million to account for the availability of prior year execution balances.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) is transforming the organization and implementation of space acquisition to an enterprise approach, maximizing innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose capabilities.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 1206431F / <i>Advanced EHF MILSATCOM (SPACE)</i> |
|---|---|

This program element may include necessary civilian pay expenses required to manage, execute, and deliver Advanced EHF MILSATCOM weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392F and 1206398F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 145.610 | 151.506 | 106.378 | 0.000 | 106.378 |
| Current President's Budget | 134.775 | 144.753 | 117.290 | 0.000 | 117.290 |
| Total Adjustments | -10.835 | -6.753 | 10.912 | 0.000 | 10.912 |
| • Congressional General Reductions | -6.039 | -1.753 | | | |
| • Congressional Directed Reductions | 0.000 | -5.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -4.796 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 10.912 | 0.000 | 10.912 |

Change Summary Explanation

FY 2019: -\$5.000M Congressional Reduction for Insufficient Justification.

FY 2020: +\$3.300M to fund AEHF Operational Resiliency Phase 3 to expand resiliency capability for all satellites; +\$5.000M to fund AEHF ground cyber protection technologies (e.g., defensive cyber operations, on-board cyber intrusion detection software-spacecraft anti-malware); +\$8.000M for PTW Army - Air Force Anti-Jam Modem (A3M); and -\$5.388M to account for the availability of prior year execution balances.

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|---|--------------------|----------------|----------------|---------------------|---|----------------------|----------------|----------------|--|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 5 | | | | | R-1 Program Element (Number/Name) PE 1206431F / <i>Advanced EHF MILSATCOM (SPACE)</i> | | | | Project (Number/Name) 657104 / <i>MILSATCOM Space Modernization Initiative (SMI)</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 657104: <i>MILSATCOM Space Modernization Initiative (SMI)</i> | 0.000 | 134.775 | 144.753 | 117.290 | 0.000 | 117.290 | 113.469 | 56.286 | 15.015 | 15.285 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

Note

Due to an accounting error, the FY 2018 funding shown above is incorrect. The correct funding is \$130.275 million. The remaining \$4.500 million was realigned to Project 657103, Advanced MILSATCOM, for transition to the next-generation cryptographic Key Management Infrastructure.

A. Mission Description and Budget Item Justification

The Space Modernization Initiative (SMI) strategy is to evolve current and future Protected MILSATCOM systems, sustain the existing AEHF system capability and develop a more affordable and resilient MILSATCOM enterprise capable of meeting near term and emerging MILSATCOM requirements. A significant thrust for this initiative is to demonstrate technologies and Concepts of Operations (CONOPS) that lead to a future Protected Anti-Jam Tactical SATCOM (PATs) capability that provides tactical-level MILSATCOM users protected, anti-jam satellite communications while operating in a contested environment. PATs will provide tactical users significantly higher data rates than AEHF and a security architecture that enables forward deployed users to have protected satellite communications in scenarios where AEHF terminals cannot be deployed. Under this construct the SMI will: 1) Reduce parts/obsolescence risk to AEHF space vehicles, 2) Continue the Capabilities Insertion Program (CIP) to enhance the AEHF constellation and Protected Communication performance and improve mission operational resiliency and 3) Invest in technologies and demonstrations (e.g., Protected Tactical Service Field Demonstration or PTSFD) that enable the future Protected Tactical Enterprise Service (PTES) and SATCOM programs by continued development of the Protected Tactical Waveform (PTW) technologies, development of PTW enabled modems, maturing the Protected Tactical Testbed, and demonstrating resilient and affordable wideband protected technologies and CONOPS.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| Title: Capabilities Insertion Program (CIP) | 54.604 | 89.007 | 89.915 |
| Description: Develop software that will increase the current AEHF constellation and Protected Communications capabilities, broaden overall user base, and accommodate a larger user population through improved resource utilization efficiencies. Develop modifications that will improve the Protected mission operational resiliency. Develop software to increase current AEHF terminal data rates with adaptive coding algorithms. | | | |
| FY 2019 Plans: Complete Inc 8.2 XDR Transition development and verifications. Continue Inc 8.3 Endurance Mission Replan (EMR). Begin Inc 8.4 Cryptologic upgrades to provide crypto and survivability improvements, maintain user communication when fixed site support is unavailable, adds capability for planning downlink resources and other improvements. Continue Operational Resiliency (OR) 2 & OR2B - Phase 1 (i.e., Engineering analysis of SV 5/6, Command and Control System - Consolidated (CCS-C) maintain vehicle | | | |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206431F / <i>Advanced EHF MILSATCOM (SPACE)</i> | Project (Number/Name) 657104 / <i>MILSATCOM Space Modernization Initiative (SMI)</i> | | |
| B. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| <p>configuration). Initiate OR2 & OR2B - Phase 2 (i.e., Engineering Analysis of SV-4 and Flight software). Continue program office support and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc.</p> <p>FY 2020 Plans: Continue Advanced AEHF Capabilities Augmentation development, XDR Transition Development and Endurance Mission Re-plan to provide crypto and survivability improvements. Maintain user communication when fixed site support is unavailable, adds capability for planning downlink resources and other improvements. Complete OR2/2B Phase 1 4Q FY 2020. Continue OR2/2B Phase 2 and prepare for OR2/2B Phase 3 (i.e., Engineering analysis of SV 1-3 and Flight software) contract award. Invest in technology demonstrations that improve the operational mission resiliency and effectiveness for all protected capabilities. These activities may include, but are not limited to W/V Frequency utility, combat cloud, crosslinks, Spacecraft as a Sensor, Flexible Commercial Planning, etc. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 increased compared to FY 2019 by \$0.908M. Justification for this increase is described in the plans above.</p> | | | | |
| <p>Title: Protected Tactical Testbed</p> <p>Description: Protected Tactical Testbed provides a government gold standard of reference for risk reduction and experimentation on critical technology elements for the space payload, terminals and networking segments of the PATS system. Supports the hardware development of the hub component for the PTES ground system and any necessary test capabilities to support either the over-the-air (OTA) or laboratory demonstrations for the PTSFD. It enables system integration capabilities with industry and FFRDC partners for interoperability testing and conducting experiments to mature the PATS operations, with a focus on the PTW.</p> <p>FY 2019 Plans: Conduct compatibility testing between the ground testbed and the Terminal Modem (TM) Line Replaceable Unit (LRU). This is a precursor activity to the compatibility testing with representative WGS payload hardware. Begin OTA testing. Expand Hub capability for PTES and PTS risk reduction event. Continue program office support and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc.</p> <p>FY 2020 Plans: Complete the first phase of OTA testing with the Hub and WGS as well as Commercial satellite assets. Complete compatibility testing between the ground testbed and Terminal Modem (TM) Line Replaceable Unit (LRU). Complete Hub capability to PTES and PTS risk reduction events.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p> | | 12.272 | 11.910 | 9.450 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206431F / <i>Advanced EHF MILSATCOM (SPACE)</i> | Project (Number/Name) 657104 / <i>MILSATCOM Space Modernization Initiative (SMI)</i> |

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| FY 2020 decreased compared to FY 2019 by \$2.46M. Justification for this decrease is described in the plans above. | | | |
| <p>Title: Protected Tactical Waveform (PTW) Modem Development and Demonstrations</p> <p>Description: This major thrust was formerly known as Protected Tactical Service Field Demonstration (PTSFD). Develop, demonstrate, test and evaluate PTW modems and components capable of being integrated into existing Army, Air Force, and Navy tactical satellite communication terminals spanning ground, aerial, and naval environments such as the Army's Satellite Transportable Terminal (STT), the Air Force's Ground Multiband Terminal (GMT), airborne terminals, and the Navy Multiband Terminal (NMT). This includes associated End Cryptographic Unit (ECU) development, testing, NSA certification, and integration with PTW modems. Conduct trade space and requirements definition with the military Services and terminal program offices to support future PTW-related capabilities. Identify potential assets such as ground hubs and information assurance components that can be further developed by future PTW-related programs. Explore opportunities and releasability of PTW-related technologies to International Partners. Protected Tactical Service Field Demonstration (PTSFD) is a technology demonstration that will develop and demonstrate prototype TM LRUs utilizing PTW over wideband space/ground systems. PTSFD includes an option to demonstrate over a commercial SATCOM system and design and build the Mission Management System (MMS) simulator. The PTSFD will demonstrate an Anti-Jam (AJ) and Low Probability of Intercept (LPI)/Low Probability of Detection (LPD) communications capability that can be provided to tactical users in all Services through fielded terminals, existing wideband MILSATCOM assets, and potential COMSATCOM assets. The Army - Air Force Anti-Jam Modem (A3M) will develop PTW modems that meet all environmental, integration, and mission requirements for STT and GMT tactical users.</p> <p>FY 2019 Plans: Complete Terminal to TM LRU Integration and Test (I&T) for each vendor and each identified service terminal. Complete Compatibility Test involving the first System Integration Lab (SIL) test using the Protected Tactical Testbed. Conduct Modem Certification Test with Army Forces Strategic Command (ARSTRAT). Conduct first Physical Hardware Equipment Chain (PHEC) test to verify compatibility using a WGS emulator on the ground prior to the WGS demo. Conduct over-the-air technology demonstrations over WGS and commercial satellites for PTSFD and conduct the second SIL test. Continue program office support and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc.</p> <p>FY 2020 Plans: Complete PTSFD Modem Certification testing with ARSTRAT. Complete PTSFD PHEC testing to verify compatibility using a WGS emulation on the ground prior to the WGS and Commercial satellite demo. Complete OTA technology demonstrations over WGS and commercial satellites for PTSFD and conduct the second SIL test. Award A3M and initiate PTW modem development.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 decreased compared to FY 2019 by \$25.911. Justification for this decrease is described in the plans above.</p> | 67.899 | 43.836 | 17.925 |
| Accomplishments/Planned Programs Subtotals | 134.775 | 144.753 | 117.290 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206431F / <i>Advanced EHF MILSATCOM (SPACE)</i> | Project (Number/Name) 657104 / <i>MILSATCOM Space Modernization Initiative (SMI)</i> |

C. Other Program Funding Summary (\$ in Millions)

| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> | | | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To</u> | |
|--|----------------|----------------|----------------|------------|--------------|----------------|----------------|----------------|----------------|-----------------|-------------------|
| | | | <u>Base</u> | <u>OCO</u> | <u>Total</u> | | | | | <u>Complete</u> | <u>Total Cost</u> |
| • SPAF 01 Line Item ADV555: <i>Advanced EHF</i> | 55.667 | 29.829 | 31.894 | - | 31.894 | 17.240 | - | - | - | 0.000 | 134.630 |

Remarks

Army and Air Force Anti-jam Modem (A3M) is a joint effort between the MILSATCOM Directorate (SMC/MC) and the Program Manager (PM) Tactical Networks (TM), Aberdeen Proving Ground (APG) to develop a common modem for the AF Ground Multi-band Terminal (GMT) and Army Satellite Transportable Terminal (STT). Leveraging similar mission and environmental requirements enables selection of the high water mark requirements to meet both mission parameters with greater efficiency while reducing risk and lifecycle cost.

D. Acquisition Strategy

A3M will be a Rapid Acquisition program utilizing Rapid Prototyping transitioning to Rapid Fielding IAW Sec 804 NDAA FY 2016. A3M leverages the PTSFD technology maturation resulting in a low risk development effort delivering production ready PTW capable modems with certified ECUs and all required Intellection Property rights, provisioning documentation, and training materials to enable swift terminal modification for operational use and sustainment. The Rapid Prototyping phase will deliver pre-production prototypes ready for "build to print" production for blended developmental testing which includes operational type tests including full environmental, blue, and red team testing prior to the Beta production decision. This acquisition approach reduces operational risk by enabling a fix cycle before production or acceleration if immediate productions is warranted.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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|--|--|--|--|---|--|--|--|--|--|--|----------------------------|--|--|--|--|
| Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force | | | | | | | | | | | Date: February 2019 | | | | |
| Appropriation/Budget Activity 3600 / 5 | | | | R-1 Program Element (Number/Name) PE 1206431F / <i>Advanced EHF MILSATCOM (SPACE)</i> | | | | Project (Number/Name) 657104 / <i>MILSATCOM Space Modernization Initiative (SMI)</i> | | | | | | | |

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | | | |
|--|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | Target Value of Contract |
| Capabilities Insertion Program (CIP) | SS/CPIF | Lockheed Martin : Sunnyvale, CA | 0.000 | 50.590 | Jun 2018 | 84.411 | Jun 2019 | 72.766 | Oct 2019 | - | | 72.766 | Continuing | Continuing | 205.445 |
| W/V Frequency utilization demonstration | MIPR | AFRL : Various | 0.000 | - | | - | | 8.600 | Nov 2019 | - | | 8.600 | Continuing | Continuing | - |
| Protected Tactical Service Field Demonstration (PTSFD) | Various | Various : Various | 0.000 | 13.810 | Oct 2017 | 15.027 | Oct 2018 | 4.395 | Oct 2019 | - | | 4.395 | Continuing | Continuing | - |
| PTSFD (Modem) Contractor 1 | C/CPIF | L3 : Camden, NJ | 0.000 | 15.751 | Jan 2018 | 6.986 | Dec 2018 | 1.621 | Nov 2019 | - | | 1.621 | 0.000 | 24.358 | - |
| PTSFD (Modem) Contractor 2 | C/CPIF | VIASAT : Carlsbad, CA | 0.000 | 10.107 | Jan 2018 | 7.631 | Dec 2018 | 1.509 | Nov 2019 | - | | 1.509 | 0.000 | 19.247 | - |
| PTSFD (Modem) Contractor 3 | C/CPIF | Raytheon : Marlborough, MA | 0.000 | 13.868 | Jan 2018 | 7.900 | Dec 2018 | 1.695 | Nov 2019 | - | | 1.695 | 0.000 | 23.463 | - |
| PTSFD (Mission Management System simulator) | MIPR | Aerospace : El Segundo, CA | 0.000 | 1.226 | Nov 2017 | 1.408 | Nov 2018 | - | | - | | - | 0.000 | 2.634 | - |
| Protected Tactical Testbed (TBED) | Various | Various : Various | 0.000 | 11.326 | Dec 2017 | 11.910 | Dec 2018 | 9.450 | Dec 2019 | - | | 9.450 | Continuing | Continuing | 37.500 |
| A3M PTW Modem Development | C/CPIF | TBD : TBD | 0.000 | - | | - | | 13.000 | Jan 2020 | - | | 13.000 | Continuing | Continuing | - |
| Technical Mission Analysis | MIPR | Aerospace : El Segundo, CA | 0.000 | 2.861 | Oct 2017 | 3.562 | Nov 2018 | - | | - | | - | 0.000 | 6.423 | - |
| Enterprise SE&I | C/CPAF | Linquest : Los Angeles, CA | 0.000 | 9.597 | Nov 2017 | - | | - | | - | | - | 0.000 | 9.597 | - |
| Subtotal | | | 0.000 | 129.136 | | 138.835 | | 113.036 | | - | | 113.036 | Continuing | Continuing | N/A |

Remarks
 Due to an accounting error, the FY 2018 CIP funding shown above is incorrect. The correct funding is \$46.090 million. The remaining \$4.500 million was realigned to Project 657103, Advanced MILSATCOM, for the transition to the next-generation cryptographic Key Management Infrastructure.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|--|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206431F / <i>Advanced EHF MILSATCOM (SPACE)</i> | Project (Number/Name) 657104 / <i>MILSATCOM Space Modernization Initiative (SMI)</i> |
|--|---|--|

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | | | |
|---|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | Target Value of Contract |
| FFRDC | MIPR | Aerospace : El Segundo, CA | 0.000 | 3.226 | Nov 2017 | 2.246 | Nov 2018 | 1.678 | Nov 2019 | - | | 1.678 | Continuing | Continuing | - |
| Other Support | Various | Various : Various | 0.000 | 0.126 | Dec 2017 | 0.200 | Nov 2018 | 0.200 | Nov 2019 | - | | 0.200 | Continuing | Continuing | - |
| A&AS | Various | Various : Various | 0.000 | 2.287 | Nov 2017 | 3.472 | Nov 2018 | 2.376 | Nov 2019 | - | | 2.376 | 0.000 | 8.135 | - |
| Subtotal | | | 0.000 | 5.639 | | 5.918 | | 4.254 | | - | | 4.254 | Continuing | Continuing | N/A |
| Project Cost Totals | | | 0.000 | 134.775 | | 144.753 | | 117.290 | | - | | 117.290 | Continuing | Continuing | N/A |

Remarks

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206431F / <i>Advanced EHF MILSATCOM (SPACE)</i> | Project (Number/Name) 657104 / <i>MILSATCOM Space Modernization Initiative (SMI)</i> |

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| MILSATCOM Space Modernization Initiative | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| CIP: Inc 8.2 XDR Transition | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CIP: Inc 8.3 Endurance Mission Replan (EMR) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CIP: Inc 8.4 Cryptologic Upgrade | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CIP: Operational Resiliency - Phase 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CIP: Operational Resiliency - Phase 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CIP: Operational Resiliency - Phase 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| W/V Frequency Utilization demonstration | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CIP Technology Studies for Resiliency | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Protected Tactical Service Field Demo (PTSFD) PTW Demo : Factory Tests (TM LRU, MMS, KMS) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Protected Tactical Service Field Demo (PTSFD) PTW Demo : Development Tests (TM LRU, MMS, PHEC) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Protected Tactical Service Field Demo (PTSFD) PTW Demo : Conduct End to End OTA Demonstration | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Protected Tactical Testbed: Factory Tests (TM LRU, MMS, KMS) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Protected Tactical Testbed: Support Development Tests (TM LRU, MMS, PHEC) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Protected Tactical Testbed: Support End to End OTA Demonstration (TM LRU, MMS, PHEC) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A3M PTW Modem Award & Development | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206431F / <i>Advanced EHF MILSATCOM (SPACE)</i> | Project (Number/Name) 657104 / <i>MILSATCOM Space Modernization Initiative (SMI)</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>MILSATCOM Space Modernization Initiative</i> | | | | |
| CIP: Inc 8.2 XDR Transition | 1 | 2018 | 1 | 2020 |
| CIP: Inc 8.3 Endurance Mission Replan (EMR) | 4 | 2018 | 3 | 2020 |
| CIP: Inc 8.4 Cryptologic Upgrade | 4 | 2019 | 1 | 2022 |
| CIP: Operational Resiliency - Phase 1 | 4 | 2018 | 4 | 2020 |
| CIP: Operational Resiliency - Phase 2 | 4 | 2019 | 4 | 2021 |
| CIP: Operational Resiliency - Phase 3 | 4 | 2020 | 4 | 2022 |
| W/V Frequency Utilization demonstration | 1 | 2020 | 4 | 2022 |
| CIP Technology Studies for Resiliency | 2 | 2020 | 4 | 2021 |
| Protected Tactical Service Field Demo (PTSFD) PTW Demo : Factory Tests (TM LRU, MMS, KMS) | 2 | 2018 | 4 | 2018 |
| Protected Tactical Service Field Demo (PTSFD) PTW Demo : Development Tests (TM LRU, MMS, PHEC) | 4 | 2018 | 3 | 2020 |
| Protected Tactical Service Field Demo (PTSFD) PTW Demo : Conduct End to End OTA Demonstration | 2 | 2019 | 3 | 2020 |
| Protected Tactical Testbed: Factory Tests (TM LRU, MMS, KMS) | 1 | 2018 | 4 | 2018 |
| Protected Tactical Testbed: Support Development Tests (TM LRU, MMS, PHEC) | 4 | 2018 | 3 | 2020 |
| Protected Tactical Testbed: Support End to End OTA Demonstration (TM LRU, MMS, PHEC) | 2 | 2019 | 3 | 2020 |
| A3M PTW Modem Award & Development | 2 | 2020 | 2 | 2022 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 1206432F / <i>Polar MILSATCOM (SPACE)</i> |
|---|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | 317.362 | 32.536 | 26.380 | 427.400 | 0.000 | 427.400 | 192.000 | 129.455 | 35.550 | 10.072 | 10.342 | 1,181.097 |
| 654215: <i>EPS Recap</i> | 0.000 | 0.000 | 0.000 | 427.400 | 0.000 | 427.400 | 192.000 | 129.455 | 35.550 | 10.072 | 10.342 | 804.819 |
| 657105: <i>Polar Satellite Communications</i> | 317.362 | 32.536 | 26.380 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 376.278 |

Program MDAP/MAIS Code: 121

Note

In FY 2020, Project 654215, EPS Recap, efforts were transferred from PE 1206434F, Midterm Polar MILSATCOM System, Project 643720, EPS Recapitalization, in order to better align with the Enhanced Polar System (EPS) program.

A. Mission Description and Budget Item Justification

This program element acquires the Polar MILSATCOM system that provides protected communications (anti-jam and low probability of intercept and detection) for users in the north polar region.

Through FY 2005, Polar Satellite Communications funded three low data rate Milstar packages on three classified host satellites as an expedited, interim solution for protected connectivity requirements in the north polar region (i.e., Interim Polar System (IPS)). Two satellites with hosted packages are required to provide the necessary 24-hour coverage. The third package went into operations in November 2008 to sustain the 24-hour coverage.

In FY 2006, the DoD began funding the next generation Polar Satellite Communications capability with two more polar packages via the same host vehicle type (i.e., EPS). The host spacecraft and the polar communications packages required design modifications that replaced obsolete components and took advantage of the more capable Advanced Extremely High Frequency (AEHF) technology including the eXtended Data Rate (XDR) waveform. The EPS Capability Development Document (CDD), approved by the Joint Requirements Oversight Council in September 2006, is based on a two-package, hosted XDR program with operational availability in CY 2015 and CY 2017. EPS is comprised of four segments: Payload, Ground Control, Gateway, and Terminal (acquired by each Service's Terminal Program Office). Milestone B review was completed April 2, 2014.

Beginning FY 2020, the EPS-Recapitalization (EPS-R) effort transferred from Program Element 1206434F, Midterm Polar MILSATCOM System to Program Element 1206432F, Polar MILSATCOM (SPACE). In FY 2020, EPS-R continues to develop and acquire two Extremely High Frequency (EHF) payloads on hosted spacecraft and continues to upgrade/modify the existing EPS Ground Control and Gateway.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) is transforming the organization and implementation of space acquisition to an enterprise approach, maximizing innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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|---|--|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 1206432F / <i>Polar MILSATCOM (SPACE)</i> |
|---|--|

authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose capabilities.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver Polar MILSATCOM weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392F and 1206398F.

Synch Polar Satellite Communications (SATCOM) with Family of Beyond Line-of-Sight Terminal (FAB-T) saved \$19.1M in FY 2020. Synch Polar SATCOM with FAB-T Description: A two-year delay in strategic communications upgrades to Enhanced Polar System C2 network is necessary to synchronize SATCOM capabilities with airborne terminal fielding. In alignment with the National Defense Strategy, funds were applied to classified programs, which improve lethality.

Funding in this exhibit was previously budgeted in PE 0605432F, Polar MILSATCOM (SPACE), and PE 1206434F, Midterm Polar MILSATCOM System.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 33.644 | 27.337 | 0.000 | 0.000 | 0.000 |
| Current President's Budget | 32.536 | 26.380 | 427.400 | 0.000 | 427.400 |
| Total Adjustments | -1.108 | -0.957 | 427.400 | 0.000 | 427.400 |
| • Congressional General Reductions | 0.000 | -0.957 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -1.108 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 427.400 | 0.000 | 427.400 |

Change Summary Explanation

FY 2020: +\$446.461M, transferred from PE 1206434F, Midterm Polar MILSATCOM System, Project 643720, EPS Recapitalization; -\$19.061M, to synchronize strategic requirements with the Force Element Terminal (FET) initial operational capability.

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|---|--------------------|----------------|----------------|---------------------|--|----------------------|----------------|----------------|---|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 5 | | | | | R-1 Program Element (Number/Name) PE 1206432F / <i>Polar MILSATCOM (SPACE)</i> | | | | Project (Number/Name) 654215 / <i>EPS Recap</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 654215: <i>EPS Recap</i> | 0.000 | 0.000 | 0.000 | 427.400 | 0.000 | 427.400 | 192.000 | 129.455 | 35.550 | 10.072 | 10.342 | 804.819 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

Note

In FY 2020, Project 654215, EPS Recap, efforts were transferred from PE 1206434F, Midterm Polar MILSATCOM System, Project 643720, EPS Recapitalization, in order to better align with the Enhanced Polar System (EPS) program.

A. Mission Description and Budget Item Justification

This program element acquires the Polar MILSATCOM system (EPS) and the continuation effort, EPS Recapitalization (EPS-R) providing protected communications (anti-jam and low probability of intercept and detection) for users in the north polar region and prevents a gap in Arctic MILSATCOM coverage in the mid to late 2020s.

In FY 2018, via PE 1206434F the DoD funded EPS-R to develop and acquire 1) two Extremely High Frequency (EHF) payloads, using Advanced EHF's (AEHF's) eXtended Data Rate (XDR) waveform, on hosted spacecraft, 2) upgrades/modifications to the existing EPS Control and Planning Segment (CAPS) to provide command and control and XDR mission planning capability, and 3) upgrades/ modifications to the existing EPS gateway to provide connectivity between polar and midlatitude users through Department of Defense Information Networks (DODIN). EPS-R intends to host the payloads on a Space Norway bus scheduled to launch in CY 2022. EPS-R will reuse EPS Gateway and ground control elements to the greatest extent feasible.

To meet the warfighter requirements for protected tactical and strategic polar MILSATCOM, RDT&E funding is required to continue program office and other related support activities including, but are not limited to studies, technical analysis, architectural development, technology maturation, System Engineering, Integration and Test of all polar MILSATCOM segments and hosted payloads.

Programs and projects in the space warfighting enterprise are evaluating ways to maximize innovation, resiliency, and our ability to rapidly respond to known and emerging threats. Space enterprise efforts aim to execute technology risk reduction efforts, integration of new or repurposed capabilities, enterprise decision-making tools, experimentation, and rapid prototyping and fielding via all appropriate acquisition authorities and contract mechanisms.

| | | | |
|--|----------------|----------------|----------------|
| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
| Title: Space Segment | 0.000 | 0.000 | 366.432 |
| Description: Develop and acquire two EHF payloads, using AEHF's XDR waveform, for integration on host spacecraft. | | | |
| FY 2019 Plans: N/A | | | |
| FY 2020 Plans: | | | |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206432F / <i>Polar MILSATCOM (SPACE)</i> | Project (Number/Name) 654215 / <i>EPS Recap</i> | | |
| B. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| <p>In FY 2020 this thrust title was changed from Payload to Space Segment. Continue development, production, and testing of the two payloads that were initiated in FY 2018. Continue developing interface documentation and integration plans with international partner, Space Norway. Continue funding USAF share of Arctic Memorandum of Agreement (MOA) collaboration costs for hosting of the EPS-R payloads. Facilitate coordination between Space Norway, space vehicle developer, and payload contractor. Provide representation, technical expertise, and assistance at Space Norway and/or space vehicle developer facilities. Continue cyber certification efforts with the National Security Agency (NSA). Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 increased compared to FY 2019 by \$366.432M because funds were budgeted in Midterm Polar MILSATCOM System PE 1206434F in FY 2019.</p> | | | | |
| <p>Title: Ground Updates</p> <p>Description: Modify and upgrade the existing EPS CAPS to provide command and control and XDR mission planning capability for the two new payloads.</p> <p>FY 2019 Plans: N/A</p> <p>FY 2020 Plans: Continue risk reduction efforts on and upgrade EPS CAPS Segment. Conduct ground Critical Design Review. Acquire Defense Information Systems Network (DISN) lines from Schriever AFB to the Space Norway Host Ground Station to ensure out-of-command connectivity to the payload.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 increased compared to FY 2019 by \$45.046M because funds were budgeted in Midterm Polar MILSATCOM System PE 1206434F in FY 2019.</p> | | 0.000 | 0.000 | 45.046 |
| <p>Title: Gateway Updates</p> <p>Description: Modify and upgrade to the existing EPS Gateway Segment to support the two new payloads.</p> <p>FY 2019 Plans: N/A</p> <p>FY 2020 Plans:</p> | | 0.000 | 0.000 | 15.922 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206432F / <i>Polar MILSATCOM (SPACE)</i> | Project (Number/Name) 654215 / <i>EPS Recap</i> |

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| Continue risk reduction efforts on EPS Gateway Segment upgrades. Continue preparations for installing a second telemetry and control terminal. Purchase additional telemetry and control terminals to recapitalize equipment that is becoming obsolete. | | | |
| <i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> FY 2020 increased compared to FY 2019 by \$15.922M because funds were budgeted in Midterm Polar MILSATCOM System PE 1206434F in FY 2019. | | | |
| Accomplishments/Planned Programs Subtotals | 0.000 | 0.000 | 427.400 |

| C. Other Program Funding Summary (\$ in Millions) | | | | | | | | | | | |
|---|----------------|----------------|-------------------------|------------------------|--------------------------|----------------|----------------|----------------|----------------|-----------------------------|-------------------|
| Line Item | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| • RDTE 04 1206434F: <i>Midterm Polar MILSATCOM System</i> | 60.123 | 383.113 | - | - | - | - | - | - | - | 0.000 | 443.236 |

Remarks

D. Acquisition Strategy

Award payloads contract to Northrop Grumman Aerospace Systems (NGAS) and initiate production of two EPS functional equivalent payloads in FY 2018 (PE 1206434F). Conduct market research to identify industry capabilities and acquisition concepts. Award CAPS contract for EPS ground upgrade. Gateway updates will be accomplished by Space and Naval Warfare Systems Center Pacific, the EPS Gateway developer. The program office initiates the procurement of a replacement terminal for the Telemetry and Command Terminal. This acquisition strategy updates the EPS Ground Segment to accommodate the EPS functional equivalent payloads and extend operations and sustainment beyond 2028. The U.S. Government will retain the system integrator role, as it was for EPS program of record.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206432F / Polar MILSATCOM (SPACE) | Project (Number/Name) 654215 / EPS Recap |
|--|---|--|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| EPS-R Tactical Payloads 1-2 | SS/CPAF | NGAS : Redondo Beach, CA | 0.000 | - | | - | | 328.100 | Nov 2019 | - | | 328.100 | 221.836 | 549.936 | - |
| Control and Planning Segment Upgrades | TBD | NGMS : Redondo Beach, CA | 0.000 | - | | - | | 40.334 | Nov 2019 | - | | 40.334 | 77.000 | 117.334 | - |
| Gateway Upgrades | Various | Various : Various, CA | 0.000 | - | | - | | 14.256 | Nov 2019 | - | | 14.256 | 6.000 | 20.256 | - |
| Technical Mission Analysis | MIPR | Aerospace : El Segundo, CA | 0.000 | - | | - | | 8.851 | Nov 2019 | - | | 8.851 | 21.752 | 30.603 | - |
| Enterprise SE&I | C/CPAF | LinQuest : Los Angeles, CA | 0.000 | - | | - | | 24.823 | Nov 2019 | - | | 24.823 | 36.420 | 61.243 | - |
| Subtotal | | | 0.000 | - | | - | | 416.364 | | - | | 416.364 | 363.008 | 779.372 | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| FFRDC | MIPR | Aerospace : El Segundo, CA | 0.000 | - | | - | | 2.338 | Oct 2019 | - | | 2.338 | 6.413 | 8.751 | - |
| A&AS | Various | Various : Various | 0.000 | - | | - | | 8.548 | Oct 2019 | - | | 8.548 | 7.548 | 16.096 | - |
| Other Support | Various | Various : Various | 0.000 | - | | - | | 0.150 | Oct 2019 | - | | 0.150 | 0.450 | 0.600 | - |
| Subtotal | | | 0.000 | - | | - | | 11.036 | | - | | 11.036 | 14.411 | 25.447 | N/A |

| Project Cost Totals | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|--------------------|----------------|----------------|---------------------|--------------------|----------------------|-------------------------|-------------------|---------------------------------|
| | 0.000 | - | 0.000 | 427.400 | - | 427.400 | 377.419 | 804.819 | N/A |

Remarks

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206432F / Polar MILSATCOM (SPACE) | Project (Number/Name) 654215 / EPS Recap |
|--|---|--|

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|--|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| <i>Space Segment</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Payload Design/Build | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| International Collaboration w/ Norway | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Space Vehicle Integration/Test | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Ground and Gateway Upgrades/ Modifications</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Risk Reduction Activities/Studies | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ground Critical Design Review (CDR) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Acquire Telemetry and Control Terminals | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Upgrades/Modifications | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| System Level Integration and Test | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206432F / <i>Polar MILSATCOM (SPACE)</i> | Project (Number/Name) 654215 / <i>EPS Recap</i> |
|--|--|---|

Schedule Details

| Events by Sub Project | Start | | End | |
|---|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Space Segment</i> | | | | |
| Payload Design/Build | 1 | 2020 | 1 | 2022 |
| International Collaboration w/ Norway | 1 | 2020 | 1 | 2024 |
| Space Vehicle Integration/Test | 4 | 2021 | 1 | 2023 |
| <i>Ground and Gateway Upgrades/Modifications</i> | | | | |
| Risk Reduction Activities/Studies | 1 | 2020 | 4 | 2023 |
| Ground Critical Design Review (CDR) | 2 | 2020 | 3 | 2020 |
| Acquire Telemetry and Control Terminals | 1 | 2020 | 4 | 2022 |
| Upgrades/Modifications | 1 | 2020 | 4 | 2023 |
| System Level Integration and Test | 2 | 2021 | 1 | 2024 |

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206432F / <i>Polar MILSATCOM (SPACE)</i> | Project (Number/Name) 657105 / <i>Polar Satellite Communications</i> |
|--|--|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| 657105: <i>Polar Satellite Communications</i> | 317.362 | 32.536 | 26.380 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 376.278 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

This program element acquires the Polar MILSATCOM system that provides protected communications (anti-jam and low probability of intercept and detection) for users in the north polar region.

Through FY 2005, Polar Satellite Communications funded three low data rate Milstar packages on three classified host satellites as an expedited, interim solution for protected connectivity requirements in the north polar region (i.e., Interim Polar System (IPS)). Two satellites with hosted packages are required to provide the necessary 24-hour coverage. The third package went into operations in November 2008 to sustain the 24-hour coverage.

In FY 2006, the DoD began funding the next generation Polar Satellite Communications capability with two more polar packages via the same host vehicle type (i.e., Enhanced Polar System (EPS)). The host spacecraft and the polar communications packages required design modifications that replaced obsolete components and took advantage of the more capable Advanced Extremely High Frequency (AEHF) technology including the eXtended Data Rate (XDR) waveform. The EPS Capability Development Document (CDD), approved by the Joint Requirements Oversight Council in September 2006, is based on a two-package, hosted XDR program with operational availability in CY 2015 and CY 2017. EPS is comprised of four segments: Payload, Ground Control, Gateway, and Terminal (acquired by each Service's Terminal Program Office). Milestone B review was completed 2 April 2014.

Programs and projects in the space warfighting enterprise are evaluating ways to maximize innovation, resiliency, and our ability to rapidly respond to known and emerging threats. Space enterprise efforts aim to execute technology risk reduction efforts, integration of new or repurposed capabilities, enterprise decision-making tools, experimentation, and rapid prototyping and fielding via all appropriate acquisition authorities and contract mechanisms.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver Polar MILSATCOM weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392F and 1206398F.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|--|---------|---------|---------|
| Title: EPS | 32.536 | 26.380 | 0.000 |
| Description: Develop and acquire EPS MILSATCOM which consists of: 1) two Extremely High Frequency payloads, using AEHF's XDR waveform, on hosted spacecraft; 2) a standalone Control and Planning Segment (CAPS) to provide command and control and XDR mission planning capability; and 3) one gateway to provide connectivity between polar and mid-latitude users through the Global Information Grid. | | | |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206432F / <i>Polar MILSATCOM (SPACE)</i> | Project (Number/Name) 657105 / <i>Polar Satellite Communications</i> |

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| <p><i>FY 2019 Plans:</i> Complete software sustainment builds, cyber security updates, and Operational Test and Evaluation (OT&E) report. Funds Preoperational Support (PS)/Interim Contractor Support (ICS) in order to support final O&M contract award. Continue to appropriately staff contractor-operated protected communications satellite system for operational trial period and troubleshoot system anomalies during PS/ICS period. Continue program office support and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc.</p> <p><i>FY 2020 Plans:</i> N/A.</p> <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> FY 2020 decreased compared to FY 2019 by \$26.380M. Justification for this decrease is described in plans above.</p> | | | |
| Accomplishments/Planned Programs Subtotals | 32.536 | 26.380 | 0.000 |

C. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

D. Acquisition Strategy

The EPS is the follow-on to the currently operational IPS and is a component of the Extremely High Frequency SATCOM architecture providing secure, protected communications to worldwide users. The EPS acquisition consists of four segments (Payload, Ground Control, Gateway, and Terminal) acquired by separate procurement actions. Each EPS payload and its integration onto classified host satellites is funded by the EPS program while the development and integration is performed by the host organization. The MILSATCOM Systems Directorate will procure the Ground Control and Planning Segment. The Ground Gateway segment, funded by the EPS program, will be organically developed by the Navy's Space and Naval Warfare Systems Center Pacific, San Diego, CA. The MILSATCOM Systems Directorate is the prime systems integrator for the EPS payload, ground control, and gateway segments. The Terminals that will use EPS will be acquired by each Service's Terminal Program Office.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|---|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206432F / Polar MILSATCOM (SPACE) | Project (Number/Name) 657105 / Polar Satellite Communications |
|--|---|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|---|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Control and Planning Segment | C/CPIF | NGMS : Redondo Beach, CA | 154.992 | 13.527 | Nov 2017 | 10.755 | Nov 2018 | - | | - | | - | 0.000 | 179.274 | 148.600 |
| Gateway architecture development | MIPR | Space and Naval Warfare Systems Command (SPAWAR) Systems Center - Pacific : San Diego, CA | 46.940 | 6.818 | Jan 2018 | 5.700 | Nov 2018 | - | | - | | - | 0.000 | 59.458 | 75.454 |
| EPS Design/Development Contract | SS/CPAF | NGMS : Redondo Beach, CA | 9.014 | 2.265 | Apr 2018 | 2.265 | Nov 2018 | - | | - | | - | 0.000 | 13.544 | 606.693 |
| T&C-T Development | MIPR | Lincoln Labs : Boston, MA | 9.357 | 2.055 | Nov 2017 | 1.595 | Nov 2018 | - | | - | | - | 0.000 | 13.007 | - |
| Technical Mission Analysis | Various | Various : Various | 13.085 | 4.123 | Oct 2017 | 1.245 | Nov 2018 | - | | - | | - | 0.000 | 18.453 | - |
| Enterprise SE&I | Various | Various : Various | 35.690 | 2.709 | Jun 2018 | 2.505 | Nov 2018 | - | | - | | - | 0.000 | 40.904 | - |
| Subtotal | | | 269.078 | 31.497 | | 24.065 | | - | | - | | - | 0.000 | 324.640 | N/A |

| Test and Evaluation (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Planning/Management Support for T&E | MIPR | Various : Various | 1.279 | - | | - | | - | | - | | - | 0.000 | 1.279 | - |
| Subtotal | | | 1.279 | - | | - | | - | | - | | - | 0.000 | 1.279 | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| FFRDC | Various | Various : Various | 18.648 | 0.719 | Oct 2017 | 0.124 | Nov 2018 | - | | - | | - | 0.000 | 19.491 | - |
| A&AS | Various | Various : Various | 27.597 | - | | 1.921 | Nov 2018 | - | | - | | - | 0.000 | 29.518 | - |
| Other Support | Various | Various : Various | 0.760 | 0.320 | Nov 2017 | 0.270 | Nov 2018 | - | | - | | - | 0.000 | 1.350 | - |
| Subtotal | | | 47.005 | 1.039 | | 2.315 | | - | | - | | - | 0.000 | 50.359 | N/A |

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--------------------------------------|--|--|
| Appropriation/Budget Activity | R-1 Program Element (Number/Name) | Project (Number/Name) |
| 3600 / 5 | PE 1206432F / <i>Polar MILSATCOM (SPACE)</i> | 657105 / <i>Polar Satellite Communications</i> |

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|
| Project Cost Totals | 317.362 | 32.536 | 26.380 | - | - | - | 0.000 | 376.278 | N/A |

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|--|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206432F / <i>Polar MILSATCOM (SPACE)</i> | Project (Number/Name) 657105 / <i>Polar Satellite Communications</i> |
|--|--|--|

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|--|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
|--|--|
| <i>Enhanced Polar System</i> | |
| Availability of Payload #2 | |
| Conduct Multiservice Operational Test and Evaluation (MOT&E) | |
| IOC/FOC declaration | |
| Preoperational Support/Interim Contractor Support | |

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force **Date:** February 2019

| | | |
|--|--|--|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206432F / <i>Polar MILSATCOM (SPACE)</i> | Project (Number/Name) 657105 / <i>Polar Satellite Communications</i> |
|--|--|--|

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Enhanced Polar System</i> | | | | |
| Availability of Payload #2 | 1 | 2018 | 1 | 2018 |
| Conduct Multiservice Operational Test and Evaluation (MOT&E) | 2 | 2019 | 3 | 2019 |
| IOC/FOC declaration | 4 | 2019 | 4 | 2019 |
| Preoperational Support/Interim Contractor Support | 3 | 2018 | 3 | 2019 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 1206433F / <i>Wideband Global SATCOM (SPACE)</i> |
|---|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 6.535 | 3.970 | 1.920 | 0.000 | 1.920 | 0.000 | 0.000 | 0.000 | 2.973 | 0.000 | 15.398 |
| 657102: <i>Command & Control Sys-Consolidated (CCS-C)</i> | - | 4.011 | 3.970 | 1.920 | 0.000 | 1.920 | 0.000 | 0.000 | 0.000 | 2.973 | 0.000 | 12.874 |
| 657107: <i>WGS Space Systems Resiliency Upgrade</i> | - | 2.524 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2.524 |

A. Mission Description and Budget Item Justification

The Military Satellite Communications (MILSATCOM) Command and Control System-Consolidated (CCS-C) system provides integrated launch and on-orbit command and control (C2) functionality at Schriever AFB and Vandenberg AFB for MILSATCOM satellites. Schriever AFB is used for primary operations and Vandenberg AFB is used for backup operations. CCS-C uses modified commercial off the shelf hardware/software to control emerging and legacy MILSATCOM systems including Milstar, Defense Satellite Communications System (DSCS), Wideband Global SATCOM (WGS) and Advanced Extremely High Frequency (AEHF) satellites.

The CCS-C project 657102 funds system architecture evolution to provide increased performance for additional satellites and to comply with DoD, Air Force, and Air Force Space Command (AFSPC)-directed standards for Information Assurance, Satellite Control Standardization, and Net-Readiness. This continuing effort was previously funded in the FY 2014 President's Budget and prior as an Acquisition Category II (ACAT II) program. With the 10 October 2013 Final Operational Capability (FOC) declaration, the program has transitioned to an ACAT III program, the CCS-C Assurance and Capability Enhancement (CACE), beginning FY 2014. FY 2020 will be the final year for the CACE effort. The newly enhanced CCS-C system will remain and continue to be funded with O&M funds. The WGS and AEHF procurement program elements fund the mission unique software and databases for the WGS Block II Follow-On satellites and the AEHF 4-6 satellites, respectively.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) is transforming the organization and implementation of space acquisition to an enterprise approach, maximizing innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose capabilities.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver Wideband Global SATCOM (Space) weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392F and 1206398F.

Funding in this exhibit was previously budgeted in PE 0605433F, Wideband Global SATCOM (SPACE).

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 1206433F / <i>Wideband Global SATCOM (SPACE)</i> |
|---|---|

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 14.263 | 3.970 | 1.920 | 0.000 | 1.920 |
| Current President's Budget | 6.535 | 3.970 | 1.920 | 0.000 | 1.920 |
| Total Adjustments | -7.728 | 0.000 | 0.000 | 0.000 | 0.000 |
| • Congressional General Reductions | -0.476 | 0.000 | | | |
| • Congressional Directed Reductions | -7.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -0.252 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Change Summary Explanation

FY2018: -\$7.000M, Congressional Directed Reduction for "AoA duplication of effort."

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|---|--------------------|----------------|----------------|---------------------|---|----------------------|----------------|----------------|--|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 5 | | | | | R-1 Program Element (Number/Name) PE 1206433F / <i>Wideband Global SATCOM (SPACE)</i> | | | | Project (Number/Name) 657102 / <i>Command & Control Sys-Consolidated (CCS-C)</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 657102: <i>Command & Control Sys-Consolidated (CCS-C)</i> | - | 4.011 | 3.970 | 1.920 | 0.000 | 1.920 | 0.000 | 0.000 | 0.000 | 2.973 | 0.000 | 12.874 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

The Military Satellite Communications (MILSATCOM) Command and Control System-Consolidated (CCS-C) system provides integrated launch and on-orbit command and control (C2) functionality at Schriever AFB and Vandenberg AFB for MILSATCOM satellites. Schriever AFB is used for primary operations and Vandenberg AFB is used for backup operations. CCS-C uses modified commercial off the shelf hardware/software to control emerging and legacy MILSATCOM systems including Milstar, Defense Satellite Communications System (DSCS), Wideband Global SATCOM (WGS) and Advanced Extremely High Frequency (AEHF) satellites.

The CCS-C project 657102 funds system architecture evolution to provide increased performance for additional satellites and to comply with DoD, Air Force, and Air Force Space Command (AFSPC)-directed standards for Information Assurance, Satellite Control Standardization, and Net-Readiness. This continuing effort was previously funded in the FY 2014 President's Budget and prior as an Acquisition Category II (ACAT II) program. With the 10 October 2013 Final Operational Capability (FOC) declaration, the program has transitioned to an ACAT III program, the CCS-C Assurance and Capability Enhancement (CACE), beginning FY 2014. FY 2020 will be the final year for the CACE effort. The newly enhanced CCS-C system will remain and continue to be funded with O&M funds. The WGS and AEHF procurement program elements fund the mission unique software and databases for the WGS Block II Follow-On satellites and the AEHF 4-6 satellites, respectively.

Programs and projects in the space warfighting enterprise are evaluating ways to maximize innovation, resiliency, and our ability to rapidly respond to known and emerging threats. Space enterprise efforts aim to execute technology risk reduction efforts, integration of new or repurposed capabilities, enterprise decision-making tools, experimentation, and rapid prototyping and fielding via all appropriate acquisition authorities and contract mechanisms.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| Title: CCS-C development | 4.011 | 3.970 | 1.920 |
| Description: Develop system architecture to provide enhanced C2 of MILSATCOM satellites. | | | |
| FY 2019 Plans: Continue to execute implementation, integration, and conduct test verification activities for all CCS-C modifications. Continue to execute Development Test and initiate Operational Test at Schriever AFB. Continue to manage the operational CCS-C & CACE baseline throughout testing activities. Continue program office support and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc. | | | |
| FY 2020 Plans: | | | |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | Date: February 2019 |
|---|----------------------------|

| | | |
|--|---|--|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206433F / <i>Wideband Global SATCOM (SPACE)</i> | Project (Number/Name) 657102 / <i>Command & Control Sys-Consolidated (CCS-C)</i> |
|--|---|--|

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|---------|---------|---------|
| Complete Operational Testing for CACE scheduled for 3rd Qtr FY 2020 at which time CACE transitions to Sustainment. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, prototyping, etc. | | | |
| <i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> FY 2020 decreased compared to FY 2019 by \$2.05M. Justification for this decrease is described in the plans above. | | | |
| Accomplishments/Planned Programs Subtotals | 4.011 | 3.970 | 1.920 |

| C. Other Program Funding Summary (\$ in Millions) | | | | | | | | | | | |
|--|----------------|----------------|---------------------|--------------------|----------------------|----------------|----------------|----------------|----------------|-------------------------|-------------------|
| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020 Base</u> | <u>FY 2020 OCO</u> | <u>FY 2020 Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To Complete</u> | <u>Total Cost</u> |
| • SPAF 01 Line Item MILSAT: <i>Milsatcom Space</i> | 0.277 | 0.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.277 |
| • SPAF 01 ADV555: <i>Advanced EHF</i> | 3.244 | 0.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 3.244 |

Remarks

D. Acquisition Strategy
Competitive contract was awarded in November 2012 and began performance in January 2013. The CCS-C Production and Sustainment Contract (CPASC) includes effort to increase the capability of the CCS-C system to provide ongoing C2, launch readiness support, and anomaly resolution for MILSATCOM satellite families. The CCS-C project 657102 funds system architecture evolution to provide increased performance for additional satellites and to comply with DoD, Air Force, and AFSPC-directed standards for Information Assurance, Satellite Control Standardization, and Net-Readiness.

E. Performance Metrics
Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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| Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force | | | | | | | | | | | | Date: February 2019 | | | | |
|--|-----------------------------------|---|--------------------|---|-------------------|----------------|-------------------|---------------------|---|--------------------|-------------------|----------------------------|-------------------------|-------------------|---------------------------------|--|
| Appropriation/Budget Activity 3600 / 5 | | | | R-1 Program Element (Number/Name) PE 1206433F / Wideband Global SATCOM (SPACE) | | | | | Project (Number/Name) 657102 / Command & Control Sys- Consolidated (CCS-C) | | | | | | | |
| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | | | | |
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | Target Value of Contract | |
| Production and Sustainment Contract | C/FPIF | Kratos : San Diego, CA | - | 3.520 | Oct 2017 | 3.189 | Nov 2018 | 1.454 | Nov 2019 | - | | 1.454 | 0.000 | 8.163 | 0.000 | |
| Technical Mission Analysis | C/Various | Aerospace : El Segundo, CA | - | 0.000 | Oct 2017 | 0.277 | Nov 2018 | - | | - | | - | 0.000 | 0.277 | - | |
| Enterprise SE&I | C/CPIF | LinQuest : Los Angeles, CA | - | 0.142 | Oct 2017 | 0.437 | Nov 2018 | 0.346 | Nov 2019 | - | | 0.346 | 0.000 | 0.925 | 0.000 | |
| Subtotal | | | - | 3.662 | | 3.903 | | 1.800 | | - | | 1.800 | 0.000 | 9.365 | N/A | |
| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | | | | |
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | Target Value of Contract | |
| A&AS | Various | Various : Various | - | 0.349 | Oct 2017 | 0.067 | Nov 2018 | 0.115 | Nov 2019 | - | | 0.115 | 0.000 | 0.531 | 0.000 | |
| Other Support | Various | Various : Various | - | 0.000 | Oct 2017 | 0.000 | Nov 2018 | 0.005 | Nov 2019 | - | | 0.005 | 0.000 | 0.005 | - | |
| Subtotal | | | - | 0.349 | | 0.067 | | 0.120 | | - | | 0.120 | 0.000 | 0.536 | N/A | |
| Project Cost Totals | | | - | 4.011 | | 3.970 | | 1.920 | | - | | 1.920 | 0.000 | 9.901 | N/A | |
| Remarks | | | | | | | | | | | | | | | | |

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206433F / <i>Wideband Global SATCOM (SPACE)</i> | Project (Number/Name) 657102 / <i>Command & Control Sys-Consolidated (CCS-C)</i> |

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
|--|------------|
| Command and Control System Consolidated (CCS-C) | |
| Capacity Upgrade: "Wideband Capacity Capability Improvement." | [REDACTED] |
| Resource Pooling:--"Processing Architecture Capability Improvement for Better Resource Management"--"Automated Data Synchronization for Increased Efficiency." | [REDACTED] |
| Cryptography Upgrade: "Replace CCS-C KI-17 with KS-252" | [REDACTED] |
| Secure FTP: "Cross-Domain Capability Improvement for secure data transfer" | [REDACTED] |
| IA Controls: "8500 Compliance Capability Improvement for security." | [REDACTED] |
| Interoperability: "Interoperability Capability Improvement to Migrate to USB standard" | [REDACTED] |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206433F / <i>Wideband Global SATCOM (SPACE)</i> | Project (Number/Name) 657102 / <i>Command & Control Sys-Consolidated (CCS-C)</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Command and Control System Consolidated (CCS-C)</i> | | | | |
| Capacity Upgrade: "Wideband Capacity Capability Improvement." | 1 | 2018 | 4 | 2020 |
| Resource Pooling:--"Processing Architecture Capability Improvement for Better Resource Management"--"Automated Data Synchronization for Increased Efficiency." | 1 | 2018 | 4 | 2020 |
| Cryptography Upgrade: "Replace CCS-C KI-17 with KS-252" | 1 | 2018 | 4 | 2020 |
| Secure FTP: "Cross-Domain Capability Improvement for secure data transfer" | 1 | 2018 | 4 | 2020 |
| IA Controls: "8500 Compliance Capability Improvement for security." | 1 | 2018 | 4 | 2020 |
| Interoperability: "Interoperability Capability Improvement to Migrate to USB standard" | 1 | 2018 | 4 | 2020 |

Note

CCS-C upgrade started in 1Q, FY 2015.

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|---|--------------------|----------------|----------------|---------------------|---|----------------------|----------------|--|----------------|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 5 | | | | | R-1 Program Element (Number/Name) PE 1206433F / <i>Wideband Global SATCOM (SPACE)</i> | | | Project (Number/Name) 657107 / <i>WGS Space Systems Resiliency Upgrade</i> | | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 657107: <i>WGS Space Systems Resiliency Upgrade</i> | - | 2.524 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2.524 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

The Wideband Global SATCOM (WGS) System provides the DoD with high data rate military satellite communications (MILSATCOM) services in accordance with the Joint Space Management Board-approved MILSATCOM architecture (August 1996), the Joint Requirements Oversight Council (JROC)-approved MILSATCOM Capstone Requirements Document (October 1997), and JROC-approved WGS Operational Requirements Document (May 2000). This program was originally conceived to augment the near-term "bandwidth gap" in warfighter communications needs. Dual-frequency WGS satellites augment, then replace the DoD's Defense Satellite Communications System X-band service and augment one-way Global Broadcast Service Ka-band capabilities. In addition, WGS provides a high capacity two-way Ka-band service.

All WGS Block I (Satellites 1-3), Block II (Satellites 4-6), and the first Block II Follow-on (Satellite 7) have been launched and are operational. Satellites 8-9 successfully launched on 7 December 2016 and 18 March 2017, respectively. With the operation of WGS-5, the constellation has global coverage and Full Operational Capability (FOC) was declared on 12 May 2014. Project 657107, WGS Space Systems Resiliency Upgrade, is an Acquisition Category III (ACAT III) effort. The WGS resiliency upgrade will enable the WGS system to both locate and neutralize ground-based jamming threats to the X-band.

The Commercial SATCOM (COMSATCOM) Pilot Program consists of three phases. Pilot Phase 1 was awarded in April 2017, Pilot Phase 2 was awarded in February 2018 and Pilot Phase 3 was awarded in July 2018. These efforts demonstrate the feasibility and utility of the DoD using order-of-magnitude SATCOM capability improvements advertised by commercial companies.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| Title: COMSATCOM Pilot Program | 2.524 | 0.000 | 0.000 |
| Description: The COMSATCOM Pilot Program will be conducted in three phases. Pilot Phase 1 studied future wideband SATCOM architecture. Pilot Phase 2 will develop and demonstrate a Flexible Modem Interface (FMI). Pilot Phase 3 will study order-of-magnitude improvements in SATCOM capability, affordability, and resiliency. | | | |
| FY 2019 Plans: N/A. | | | |
| FY 2020 Plans: N/A. | | | |
| Accomplishments/Planned Programs Subtotals | 2.524 | 0.000 | 0.000 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206433F / <i>Wideband Global SATCOM (SPACE)</i> | Project (Number/Name) 657107 / <i>WGS Space Systems Resiliency Upgrade</i> |

C. Other Program Funding Summary (\$ in Millions)

| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> <u>Base</u> | <u>FY 2020</u> <u>OCO</u> | <u>FY 2020</u> <u>Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To</u> <u>Complete</u> | <u>Total Cost</u> |
|--|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|
| • SPAF 01 Line Item GAP000: <i>Wideband Global System Procurement</i> | 634.259 | 12.106 | 0.000 | - | 0.000 | 0.000 | 0.000 | - | - | 0.000 | 646.365 |

Remarks

D. Acquisition Strategy

The WGS Space Systems Resiliency Upgrade has been accomplished by modifying the WGS Block II Follow-On (B2FO) Firm Fixed Price (FFP) contract definitized in August 2010. The B2FO contract currently provides development, production, and deployment of WGS satellites 7-10. The COMSATCOM Pilot Program Phase 2 was awarded under Other Transaction Authority (OTA) to multiple vendors.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|--|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206433F / <i>Wideband Global SATCOM (SPACE)</i> | Project (Number/Name) 657107 / <i>WGS Space Systems Resiliency Upgrade</i> |
|--|---|--|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | | | |
|---|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | Target Value of Contract |
| COMSATCOM Pilot Program, Phase 3 | Various | Linquest : El Segundo, CA | - | 0.733 | Jul 2018 | - | | - | | - | | - | 0.000 | 0.733 | - |
| Lincoln Labs (COMSATCOM Pilot Program) | Various | Lincoln Labs : Lexington, MA | - | 0.550 | May 2018 | - | | - | | - | | - | 0.000 | 0.550 | - |
| Subtotal | | | - | 1.283 | | - | | - | | - | | 0.000 | 1.283 | N/A | |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | | | |
|---|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Cost To Complete | Total Cost | Target Value of Contract |
| A&AS | Various | Various : Various | - | 1.241 | Dec 2017 | - | | - | | - | | - | 0.000 | 1.241 | 1.200 |
| Subtotal | | | - | 1.241 | | - | | - | | - | | 0.000 | 1.241 | N/A | |

| Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--------------------|----------------|----------------|---------------------|--------------------|----------------------|-------------------------|-------------------|---------------------------------|
| - | 2.524 | 0.000 | - | - | - | 0.000 | 2.524 | N/A |

Remarks

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|---|---|--|
| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206433F / <i>Wideband Global SATCOM (SPACE)</i> | Project (Number/Name) 657107 / <i>WGS Space Systems Resiliency Upgrade</i> |

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
|---|--|
| No project title. | |
| X-band Anti-jam Enhancement: Ground Based Receiver Equipment Development | |
| X-band Anti-jam Enhancement: GSCCE Software Development (GBAN) | |
| X-band Anti-jam Enhancement: In Service Calibration / Geolocation / Beam SW | |
| X-band Anti-jam Enhancement: Rack Integration & Test | |
| X-band Anti-jam Enhancement: System Integration & Test and IA Certification | |
| X-band Anti-jam Enhancement: Fielding and Activation | |
| Wideband Communications Services AoA | |
| COMSATCOM Pilot Program Phase 2 Award | |
| COMSATCOM Pilot Program Phase 3 Award | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206433F / <i>Wideband Global SATCOM (SPACE)</i> | Project (Number/Name) 657107 / <i>WGS Space Systems Resiliency Upgrade</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|---|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>No project title.</i> | | | | |
| X-band Anti-jam Enhancement: Ground Based Receiver Equipment Development | 1 | 2018 | 1 | 2020 |
| X-band Anti-jam Enhancement: GSCCE Software Development (GBAN) | 1 | 2018 | 1 | 2020 |
| X-band Anti-jam Enhancement: In Service Calibration / Geolocation / Beam SW | 1 | 2018 | 1 | 2020 |
| X-band Anti-jam Enhancement: Rack Integration & Test | 4 | 2019 | 2 | 2020 |
| X-band Anti-jam Enhancement: System Integration & Test and IA Certification | 4 | 2019 | 2 | 2020 |
| X-band Anti-jam Enhancement: Fielding and Activation | 3 | 2020 | 1 | 2021 |
| Wideband Communications Services AoA | 1 | 2018 | 4 | 2018 |
| COMSATCOM Pilot Program Phase 2 Award | 2 | 2018 | 2 | 2018 |
| COMSATCOM Pilot Program Phase 3 Award | 4 | 2018 | 4 | 2018 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 1206441F / <i>Space Based Infrared System (SBIRS) High EMD</i> |
|---|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---------------------------------------|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | 10,140.598 | 119.585 | 60.565 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 10,320.749 |
| 653616: <i>SBIRS High Element Emd</i> | 10,140.598 | 119.585 | 60.565 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 10,320.749 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | - | - |

Program MDAP/MAIS Code: 210

A. Mission Description and Budget Item Justification

The SBIRS primary mission is to provide initial warning of a ballistic missile attack on the US, its deployed forces, and its allies. SBIRS enhances detection and improves reporting of intercontinental ballistic missile launches, submarine launched ballistic missile launches, and tactical ballistic missile launches. SBIRS supports Missile Defense, Battlespace Awareness, and Technical Intelligence missions by providing reliable, accurate, and timely data to Unified Combatant Commanders, Joint Task Force (JTF) Commanders, the intelligence community, and other users. SBIRS provides increased detection and tracking performance over legacy systems in order to meet requirements in Air Force Space Command's (AFSPC) Operational Requirements Document (ORD). The SBIRS system includes both space and ground elements. The space segment consists of Geosynchronous Earth Orbit (GEO) satellites, payloads hosted on satellites in Highly Elliptical Orbit (HEO), and Defense Support Program (DSP) satellites. The ground segment consists of both fixed and mobile data processing elements, communications infrastructure, and relay ground stations serving all SBIRS space elements. Four HEO payloads and four GEO satellites are on-orbit. Three of the four GEO and two of the four HEO satellites have completed AFSPC and USSTRATCOM operational acceptance and are certified for Integrated Tactical Warning/ Attack Assessment (ITW/AA) missile warning operations and technical intelligence operations. HEO-3 and HEO-4 are in a storage/residual operational mode. GEO-3 (Flight 4) is proceeding through on-orbit checkout and infrared sensor tuning following its respective launch in Jan 2018. The program of record (PoR) ground segment development exploits both the new scanner and starrer sensor data through software processing and builds user messages for missile warning and missile defense. Also, data exploitation efforts enable access to raw and processed data to expand capabilities for battlespace awareness and other applications. The baseline requirement document is the 1996 SBIRS ORD. Enterprise Systems Engineering and Integration (SE&I) provides intra- and inter-program requirements development, enterprise master planning, validation and verification, specialty engineering, and architecture development.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| | |
|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 1206441F / <i>Space Based Infrared System (SBIRS) High EMD</i> |
|---|---|

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 311.844 | 60.565 | 0.001 | 0.000 | 0.001 |
| Current President's Budget | 119.585 | 60.565 | 0.000 | 0.000 | 0.000 |
| Total Adjustments | -192.259 | 0.000 | -0.001 | 0.000 | -0.001 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | -18.675 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | -173.584 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | -0.001 | 0.000 | -0.001 |

Change Summary Explanation

FY 2018: SMI and funds originally booked under SV07-08 (effort canceled) transferred to PE 1206442F Next Gen OPIR per Congressional direction.

| | | | |
|---|----------------|----------------|----------------|
| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|

| | | | |
|---|---------|--------|-------|
| Title: SBIRS EMD | 119.585 | 60.565 | 0.000 |
| Description: Continued EMD contracts for Space and Ground segment development, concept studies/activities for obsolescence issues. | | | |
| FY 2019 Plans: Complete Block 20 Ground System Development, System Engineering and Program Management, HEO host program office support, Technical Intelligence activities, Data Processing/Exploitation/ground integration activities, systems integration and test studies. Execute Block 20 fielding and OA time phased with operational priorities to enable effective fielding of capabilities while minimizing concurrency risks to current ITW/AA operations. Decommissioning of Increment 1 facilities replaced by Block 10 will occur in a time phased manner through O&M efforts. Complete developing and fielding Command & Control, Technical Intelligence, and Battlespace Awareness operations to leverage residual capability for HEO 1/2 post-transition. Continue enterprise SE&I. Complete cyber defense improvements to SBIRS ground system architecture in Block 20 to address identified deficiencies during operational testing. Complete Standard Space Trainer (SST) Phase 3. Phase 3 incorporates the next generation of upgrades to the SBIRS SST to address current system deficiencies. Continue program office support and other related support activities that may include, but are not limited to program office support, studies, technical analysis, prototyping, etc. | | | |
| FY 2020 Plans: | | | |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| | |
|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 1206441F / <i>Space Based Infrared System (SBIRS) High EMD</i> |
|---|---|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|---------|---------|---------|
| N/A | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: N/A | | | |
| Accomplishments/Planned Programs Subtotals | 119.585 | 60.565 | 0.000 |

| D. Other Program Funding Summary (\$ in Millions) | | | | | | | | | | | |
|--|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|
| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> <u>Base</u> | <u>FY 2020</u> <u>OCO</u> | <u>FY 2020</u> <u>Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To</u> <u>Complete</u> | <u>Total Cost</u> |
| • SPAF 01 Line 13, MSSBIR: <i>SBIR High (Space)</i> | 929.058 | 108.397 | 233.952 | - | 233.952 | 176.065 | 55.188 | 8.340 | 8.490 | Continuing | Continuing |

Remarks

E. Acquisition Strategy

The pre-SDD SBIRS contracts were competed in full and open competition. Two contracts were awarded to Lockheed/Loral/Aerojet and Hughes/TRW in 1995 for the pre-SDD phase. A single contract was awarded to Lockheed Martin in 1996 for the SDD phase. This contract is still ongoing and will incrementally deliver the ground segment. Production contracts are discussed in the procurement budget exhibits.

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|--|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206441F / <i>Space Based Infrared System (SBIRS) High EMD</i> | Project (Number/Name) 653616 / <i>SBIRS High Element Emd</i> |
|--|---|--|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|---|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Pre-EMD (LMMS & Hughes) | C/CPFF | Hughes Aircraft Company : El Segundo, CA | 159.600 | - | | - | | - | | - | | - | 0.000 | 159.600 | 159.600 |
| SBIRS EMD | Various | Prime: Lockheed MartinSub:Northrop Grumman : Sunnyvale; Azusa, CA | 9,027.090 | 95.636 | Oct 2017 | 42.406 | Jan 2019 | - | | - | | - | 0.000 | 9,165.132 | 9,158.709 |
| Enterprise SE&I | C/CPAF | The Analytical Sciences Corporation : El Segundo, CA | 60.988 | 2.971 | Dec 2017 | - | | - | | - | | - | 0.000 | 63.959 | 64.541 |
| SST Phase 3 | C/CPAF | Not specified. : TBD | 0.000 | 0.382 | | 12.418 | Nov 2018 | - | | - | | - | 0.000 | 12.800 | - |
| Technology | Various | Various : Various | 11.600 | - | | - | | - | | - | | - | 0.000 | 11.600 | 11.600 |
| SBIRS Pre-SDD Contract Adjustment | Various | Various : Various | 4.780 | - | | - | | - | | - | | - | 0.000 | 4.780 | 4.780 |
| Phenomenology | Various | Various : Various | 17.350 | - | | - | | - | | - | | - | 0.000 | 17.350 | 17.350 |
| Technical Mission Analysis | RO | Aerospace Corp. : El Segundo, CA | 10.000 | 5.089 | Oct 2017 | - | | - | | - | | - | 0.000 | 15.089 | 22.794 |
| Sensor Technology | Various | Sandia National Lab : Albuquerque, NM | 13.919 | - | | - | | - | | - | | - | 0.000 | 13.919 | 10.000 |
| HEO Command & Control (C2) Ground Expansion | Various | Lockheed Martin : Sunnyvale, CA | 36.259 | - | | - | | - | | - | | - | 0.000 | 36.259 | 36.259 |
| HEO 1/2 Residual Capability | Various | Various : Various | 14.600 | - | | - | | - | | - | | - | 0.000 | 14.600 | 14.600 |
| Subtotal | | | 9,356.186 | 104.078 | | 54.824 | | - | | - | | - | 0.000 | 9,515.088 | N/A |

Remarks
Award dates represent date of first award of the funds for that fiscal year.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|--|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206441F / <i>Space Based Infrared System (SBIRS) High EMD</i> | Project (Number/Name) 653616 / <i>SBIRS High Element Emd</i> |
|--|---|--|

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---------------------------------|------------------------|---|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| WFOV Testbed Concept Study | MIPR | Millennium Space Systems : El Segundo, CA | 8.000 | - | | - | | - | | - | | - | 0.000 | 8.000 | 8.000 |
| Program Support | Various | Various : Various | 11.942 | - | | - | | - | | - | | - | 0.000 | 11.942 | 11.942 |
| Subtotal | | | 19.942 | - | | - | | - | | - | | - | 0.000 | 19.942 | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|----------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| FFRDC | RO | Aerospace Corp. : El Segundo, CA | 465.225 | 5.589 | Oct 2017 | - | | - | | - | | - | 0.000 | 470.814 | 471.006 |
| A&AS | Various | Various : Various | 168.493 | 2.559 | Dec 2017 | 0.408 | Dec 2018 | - | | - | | - | 0.000 | 171.460 | 174.682 |
| Other Support | Various | Various : Various | 130.752 | 7.359 | Oct 2017 | 5.333 | Nov 2018 | - | | - | | - | 0.000 | 143.444 | 134.510 |
| Subtotal | | | 764.470 | 15.507 | | 5.741 | | - | | - | | - | 0.000 | 785.718 | N/A |

Remarks
Award dates represent date of first award of the fiscal year.

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|
| Project Cost Totals | 10,140.598 | 119.585 | 60.565 | - | - | - | 0.000 | 10,320.748 | N/A |

Remarks

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206441F / <i>Space Based Infrared System (SBIRS) High EMD</i> | Project (Number/Name) 653616 / <i>SBIRS High Element Emd</i> |

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
|---|----------------------|
| <i>SBIRS High Element EMD</i> | |
| Block 20 Integration & Test at MCSB | ████████████████████ |
| Block 20 Operational Utility Evaluation and Initial Operational Test & Evaluation with AFOTEC | ████████ |
| B20 Completed and ITW/AA Certified | ████ |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206441F / <i>Space Based Infrared System (SBIRS) High EMD</i> | Project (Number/Name) 653616 / <i>SBIRS High Element Emd</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|---|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>SBIRS High Element EMD</i> | | | | |
| Block 20 Integration & Test at MCSB | 1 | 2018 | 2 | 2019 |
| Block 20 Operational Utility Evaluation and Initial Operational Test & Evaluation with AFOTEC | 2 | 2019 | 3 | 2019 |
| B20 Completed and ITW/AA Certified | 4 | 2019 | 4 | 2019 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
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| Appropriation/Budget Activity 3600: Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD) | R-1 Program Element (Number/Name) PE 1206442F I Next Generation OPIR |
|--|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|--|-------------|---------|---------|--------------|-------------|---------------|-----------|-----------|-----------|-----------|------------------|------------|
| Total Program Element | - | 439.497 | 643.126 | 1,395.278 | 0.000 | 1,395.278 | 1,989.520 | 2,287.702 | 2,669.754 | 3,075.826 | Continuing | Continuing |
| 657009: Space Mod Initiative | - | 173.584 | 186.556 | 205.723 | 0.000 | 205.723 | 209.731 | 200.731 | 221.409 | 225.394 | Continuing | Continuing |
| 657106: Next-Gen OPIR Ground | - | 71.018 | 257.865 | 264.768 | 0.000 | 264.768 | 498.453 | 539.678 | 340.490 | 357.950 | Continuing | Continuing |
| 657120: Next-Gen OPIR Space, Block 0 GEO | - | 185.611 | 198.705 | 817.383 | 0.000 | 817.383 | 969.220 | 1,157.467 | 1,331.302 | 1,316.920 | Continuing | Continuing |
| 657121: Next-Gen OPIR Space, Block 0 Polar | - | 9.284 | 0.000 | 107.404 | 0.000 | 107.404 | 312.116 | 389.826 | 581.843 | 579.207 | Continuing | Continuing |
| 657122: Next-Gen OPIR Space, Block 1* | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 194.710 | 596.355 | Continuing | Continuing |

*This project's R-2a exhibit has been suppressed due to funding not beginning until after FY 2020

Note

- PE 1206442F nomenclature has been updated to "Next-Generation OPIR" from "Evolved SBIRS."
- Project 657106 nomenclature has been updated to "Next-Generation OPIR Ground" from "Evolved SBIRS" to reflect the true mission of the Project.
- In FY2019 Project 657120 has been broken out into three Projects in order to improve transparency:
 - Project 657120 nomenclature has been updated to "Next-Gen OPIR Space, Block 0 GEO" from "Evolved SBIRS Space."
 - Project 657121, "Next-Gen OPIR Space, Block 0 Polar," is a new Project to provide improved transparency.
 - Project 657122, "Next-Gen OPIR Space, Block 1," is a new Project to improve transparency.
- Congressional direction transferred FY2018 funding from Project 657009, "Space Modernization Initiative" (SMI), PE 1206441F to PE 1206442F in order to isolate SBIRS Program of Record (PoR) development through completion and align SMI with future efforts.

A. Mission Description and Budget Item Justification

The Next-Generation Overhead Persistent Infrared (Next-Gen OPIR) RDT&E FY2020 budget justification exhibits describe the Next-Gen OPIR Space, Ground, and Space Modernization Initiative (SMI) programs.

1. Next-Gen OPIR Space Modernization Initiative (SMI) (Project 657009): SMI supports the SBIRS Program of Record (PoR) and Next-Gen OPIR by assessing future parts and material obsolescence, designing space and ground modifications focused on affordability and capability, and maximizing the effectiveness of existing system data products. SMI funds engineering activities to reduce both production and future system costs through manufacturing and producibility enhancements, and technology insertion. SMI will also mature potential technology upgrades at the component and system level for space and ground architecture enhancements. SMI includes studies and risk reduction activities to evolve the current PoR constellation, reduce production timelines, and reduce recurring production costs. SMI activities are balanced and phased to enable an expanded trade space and improve the competitive environment. The three major thrust areas under SMI are Demonstrations, Technology Maturation and Data Exploitation. The Demonstrations mature and demonstrate technologies with ground and on-orbit prototypes. Demonstrations advance

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| <p>system performance and algorithms for tactical and strategic applications to enhance PoR capabilities. Finally, demonstrations reduce program risks for future OPIR systems, whether new systems or evolutions of the current PoR. Technology Maturation assesses and addresses needs to support resiliency of PoR assets and future architectures that must respond to an evolving threat environment. Data Exploitation enables access to OPIR data sources to expand technical intelligence and battlespace awareness processing and data dissemination tools to support warfighters and other data users.</p> <p>Reduce SMI saved \$25.000M in FY 2020. Reduce SMI identified excess need in engineering efforts for space modernization in FY 2020. Funding decreases do not affect technology maturation for insertion into Next-Gen OPIR Block 1. Funding contributes to the acceleration of the Next-Gen OPIR initial launch capability.</p> <p>2. Next-Gen OPIR Ground (Project 657106): Next-Gen OPIR Ground, also known as Future Operationally Resilient Ground Evolution (FORGE), will consist of Command and Control (C2) migration to Air Force Space Command's Enterprise Ground Services (EGS), modernization of Mission Data Processing (MDP), and required development/upgrades to Relay Ground Stations (RGS) to meet AFSPC guidance on the current and future space domain demands. The FORGE effort will implement an open framework for MDP and migration of C2 satellite operations to integrate with EGS. FORGE and EGS efforts will provide the flexibility and scalability to integrate new sensors and capabilities more efficiently in order to meet evolving warfighter needs. The Next-Gen OPIR ground also includes risk reduction efforts to enable cyber enhancements for the PoR and Next-Gen OPIR ground systems. EGS will introduce common ground services such as Telemetry, Tracking and Command (TT&C) and automation. To support initial Next-Gen OPIR Space satellite launches without driving undue risk into the FORGE development schedule, the program will establish a risk reduction ground capability Next-Gen OPIR Interim Operations (NIO) option based on a limited Block 20 solution that can be exercised.</p> <p>3. Next-Gen OPIR Space: Is a transition from the legacy Space Based Infrared System (SBIRS) program. Next-Gen OPIR implements the direction of the Joint Requirements Oversight Council Memorandum (JROCM) 130-17, dated 21 December 2017, by developing the next generation of strategically survivable space-based missile warning OPIR platforms in both GEO and Polar orbits. This program will deliver improved core missile warning capabilities that are more survivable against emerging threats. The full Next-Gen OPIR constellation will consist of a minimum of GEO and Polar satellites in sufficient number to meet global warning coverage with no exploitable holes (5 GEO + 2 Polar) plus required backup and attrition and reconstitution reserve. The Air Force intends to acquire Next-Gen systems in block procurements. The Block 0 acquisition strategy consists of three GEO and two Polar satellites. The first GEO satellite is required no later than FY2025 and the first Polar satellite is required in FY2027. All five Block 0 satellites need to be on orbit by FY2029. Follow-on blocks will be addressed in future acquisition strategies.</p> <p>Next-Gen OPIR Space, Block 0 Geosynchronous Earth Orbit (GEO)(NGG) (Project 657120): The Program Office intends to acquire the NGG capability in two contract actions. Phase 1 was awarded in August 2018 and encompasses requirements analysis, design/development, critical path flight hardware procurement, and risk reduction efforts leading to a System Critical Design Review (CDR). Phase 2 will be awarded for the manufacturing, assembly, system integration and test, launch and early on-orbit test through the delivery of NGGs 1-3 for operational acceptance of each space vehicle.</p> <p>Next-Gen OPIR Space, Block 0 Polar (NGP) (Project 657121): The Program Office intends to acquire the NGP capability in three contract actions. Phase 0 awarded in June 2018, encompassing system and payload requirements analysis and risk reduction efforts leading to a System Requirements Review. Phase 1 will be awarded for design and development, critical path flight hardware procurement, and risk reduction efforts leading to a System Critical Design Review. Phase 2 will be awarded for the manufacturing, assembly, integration and test, and delivery of NGP satellites 1&2.</p> | | |

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Next-Gen OPIR Space, Block 1 (Project 657122): The Air Force plans to acquire subsequent blocks in a competitive environment. The Block 1 satellites will be based on the Enterprise OPIR Capability Development Document (CDD), validated by the Joint Requirements Oversight Council (JROC). The Next Gen OPIR Block 1 program acquisition will begin in FY2023 in time to deliver its first satellite by FY2030.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) is transforming the organization and implementation of space acquisition to an enterprise approach, maximizing innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose capabilities.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver Next-Generation OPIR weapon system capabilities. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392F and 1206398F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 71.018 | 643.126 | 936.450 | 0.000 | 936.450 |
| Current President's Budget | 439.497 | 643.126 | 1,395.278 | 0.000 | 1,395.278 |
| Total Adjustments | 368.479 | 0.000 | 458.828 | 0.000 | 458.828 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 256.004 | 0.000 | | | |
| • Reprogrammings | 112.475 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 458.828 | 0.000 | 458.828 |

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| <u>Change Summary Explanation</u> FY 2018: \$173.584M transferred from PE 1206441F and realigned into SMI; funds reprogrammed from PE 1203915F to increase transparency; \$73.136M transferred into Next-Gen OPIR Space, Block 0 GEO; \$9.284M transferred into Next-Gen OPIR Space, Block 0 Polar. In Sept 2018, Congress approved an above threshold reprogramming to add \$112.475M into Next-Gen OPIR Space, Block 0 GEO to support launch timeline acceleration. FY 2020: -\$25.000M from SMI to support acceleration of Next-Gen OPIR; +311.324M to support launch timeline acceleration for Next-Gen OPIR Space, Block 0 GEO; +\$51.800M to Next-Gen OPIR Space, Block 0 GEO to reduce schedule risk to meet the initial launch capability date; +37.404M for Next-Gen OPIR Space, Block 0 Polar to support launch timeline acceleration; +\$83.300M to accelerate ground development to support launch timelines. | | |

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| Appropriation/Budget Activity 3600 / 5 | | | | | R-1 Program Element (Number/Name) PE 1206442F / <i>Next Generation OPIR</i> | | | | Project (Number/Name) 657009 / <i>Space Mod Initiative</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 657009: <i>Space Mod Initiative</i> | - | 173.584 | 186.556 | 205.723 | 0.000 | 205.723 | 209.731 | 200.731 | 221.409 | 225.394 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

SMI supports the SBIRS Program of Record (PoR) and Next Gen OPIR by assessing future parts and material obsolescence, designing space and ground modifications focused on affordability and capability, and maximizing the effectiveness of existing system data products. SMI funds engineering activities to reduce both production and future system costs through manufacturing and producibility enhancements, and technology insertion. SMI will also mature potential technology upgrades at the component and system level for space and ground architecture enhancements. SMI includes studies and risk reduction activities to evolve the current PoR constellation, reduce production timelines, and reduce recurring production costs. SMI activities are balanced and phased to enable an expanded trade space and improve the competitive environment. The three major thrust areas under SMI are Demonstrations, Technology Maturation and Data Exploitation.

The Demonstrations mature and demonstrate technologies in ground and on-orbit prototypes, advance system performance and algorithms for tactical and strategic applications to enhance PoR capabilities and reduce program risks for future OPIR systems, whether new systems or evolutions of the current PoR. Technology Maturation assesses and addresses needs to support resiliency of PoR assets and future architectures responsive to the evolving threat environment. Data Exploitation enables access to OPIR data sources to expand technical intelligence and battlespace awareness processing and data dissemination tools to support warfighters and other data users.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| Title: Demonstrations | 51.705 | 60.325 | 113.838 |
| <p>Description: The Demonstrations mature and demonstrate OPIR technologies in ground and on-orbit prototypes, advance system performance, algorithms, and resiliency for future OPIR systems. The demonstrations explore technology maturation, qualification of new components, and subsystem/component prototyping to evolve the OPIR architecture. The demonstrations support maturation of MDP algorithms for tactical and strategic applications which are critical efforts to enhance PoR capabilities and to reduce program risks for future OPIR systems, whether new systems, reconstitution, or evolutions of the PoR.</p> <p>The Wide Field Of View (WFOV) demonstration matures WFOV technology and validates multi-mission capabilities including the potential for a single sensor to simultaneously perform strategic and tactical missions. Collection of on-orbit WFOV data is critical to develop algorithms to process large data sets generated by emerging large format focal planes and to reduce risk for possible future architectures. The WFOV payload and bus are separate development efforts. The WFOV testbed program provides a bus capable of demonstrating on-orbit mission performance and mitigating the development risks for employing WFOV sensors. The testbed program will integrate, test, and launch a prototype, developmental WFOV payload with a government-owned free-flyer spacecraft. The WFOV Testbed will host the WFOV payload. As an integrated Space Vehicle, the WFOV system will prove on-orbit mission performance of WFOV sensors. The WFOV payload will provide the critical on-orbit data required to develop and validate WFOV algorithms, as well as on-board MDP throughput requirements for strategic missile warning.</p> | | | |

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| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
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The Technology Demonstration space vehicle prototype(s) under development is responsive to emerging missile types and threats to the current missile warning architecture, as well as the rapidly evolving threats to the enterprise to inform the future OPIR architecture to include SBIRS, the Missile Defense Agency (MDA), and other mission partners. The assets will be Class-C mission assurance prototype(s) with a 3-5 year designed mission life and an initial launch capability beginning in 2025. The technology demonstrations will incorporate resiliency capabilities while advancing the state of the art performance technology. The demonstrations will focus on the rapid advancement, technology insertion, and launch of future generations of missile warning technologies and system resiliency components. These assets will incorporate threat mitigation technologies and other resiliency features with the goal of demonstrating these technologies in ground and on-orbit. These demonstrations will facilitate tech insertion, validate technical performance, inform future OPIR requirements, and reduce technical risk to the enterprise.

FY 2019 Plans:

Complete support of WFOV Space Vehicle integration and test. Begin integrated WFOV Space Vehicle end-to-end test and maintenance. Continue Systems Engineering, Integration and Test (SEIT) activities, including inter-segment testing and Information Assurance accreditation approval. Begin launch service integration. Continue concept refinement of technology demonstration space vehicles, and hold design reviews. Select up to two contractors to develop a system level Critical Design Review (CDR) design, mature ground integration plan, begin development of engineering model for a resiliency ground demonstration in sensor test bed, and begin procuring long lead items. Continue program office support and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc.

FY 2020 Plans:

Continue support of WFOV Space Vehicle maintenance and storage. Complete any remaining integrated WFOV Space Vehicle end-to-end test and maintenance. Continue Systems Engineering, Integration and Test (SEIT) activities, including pre-launch preparations and mission operations planning. Finalize launch service integration campaign. Execute multiple design efforts through System CDR and initiate build of Technology Demonstration program and associated ground aimed at Concept of Operations (CONOPS) and reducing technical risks for future blocks of Next Gen OPIR programs. Block 1 Prototype: Hold a System Requirements Review. Execute option for up to five contractors that culminates in a tailored Preliminary Design Review (PDR). Continue to mature ground integration plan, begin development of engineering model for a resiliency ground demonstration in sensor test bed, and begin procuring long lead items. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, space and ground prototyping, etc.

FY 2019 to FY 2020 Increase/Decrease Statement:

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| <p>The Technology Demonstration space vehicle prototype(s) under development is responsive to emerging missile types and threats to the current missile warning architecture, as well as the rapidly evolving threats to the enterprise to inform the future OPIR architecture to include SBIRS, the Missile Defense Agency (MDA), and other mission partners. The assets will be Class-C mission assurance prototype(s) with a 3-5 year designed mission life and an initial launch capability beginning in 2025. The technology demonstrations will incorporate resiliency capabilities while advancing the state of the art performance technology. The demonstrations will focus on the rapid advancement, technology insertion, and launch of future generations of missile warning technologies and system resiliency components. These assets will incorporate threat mitigation technologies and other resiliency features with the goal of demonstrating these technologies in ground and on-orbit. These demonstrations will facilitate tech insertion, validate technical performance, inform future OPIR requirements, and reduce technical risk to the enterprise.</p> <p><i>FY 2019 Plans:</i></p> <p>Complete support of WFOV Space Vehicle integration and test. Begin integrated WFOV Space Vehicle end-to-end test and maintenance. Continue Systems Engineering, Integration and Test (SEIT) activities, including inter-segment testing and Information Assurance accreditation approval. Begin launch service integration. Continue concept refinement of technology demonstration space vehicles, and hold design reviews. Select up to two contractors to develop a system level Critical Design Review (CDR) design, mature ground integration plan, begin development of engineering model for a resiliency ground demonstration in sensor test bed, and begin procuring long lead items. Continue program office support and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc.</p> <p><i>FY 2020 Plans:</i></p> <p>Continue support of WFOV Space Vehicle maintenance and storage. Complete any remaining integrated WFOV Space Vehicle end-to-end test and maintenance. Continue Systems Engineering, Integration and Test (SEIT) activities, including pre-launch preparations and mission operations planning. Finalize launch service integration campaign. Execute multiple design efforts through System CDR and initiate build of Technology Demonstration program and associated ground aimed at Concept of Operations (CONOPS) and reducing technical risks for future blocks of Next Gen OPIR programs. Block 1 Prototype: Hold a System Requirements Review. Execute option for up to five contractors that culminates in a tailored Preliminary Design Review (PDR). Continue to mature ground integration plan, begin development of engineering model for a resiliency ground demonstration in sensor test bed, and begin procuring long lead items. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, space and ground prototyping, etc.</p> <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i></p> | | | |

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| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
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| FY 2020 increased compared to FY 2019 by \$53.513M. Justification for this increase includes launch support and initial operations for WFOV. Furthermore, the cost increase supports initial requirements study and development for the Block 1 prototype demonstration. | | | |
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|-------------------------------------|--------|--------|--------|
| Title: Technology Maturation | 52.944 | 59.909 | 32.118 |
|-------------------------------------|--------|--------|--------|

Description: Assess technology needs to support resiliency of PoR assets and future architectures that are responsive to the evolving threat environment. Perform trade and design studies to assess obsolescence, affordability, capability design modifications, and CONOPS for the OPIR mission. Mature technologies and manufacturability to reduce cost, schedule, and technical risk for new component and subsystem designs that may be used in the future systems to include algorithms, Focal Plane Arrays (FPA), optical filters, on-board processors, auxiliary resiliency payloads, and other payload components for future missile warning satellites, and reconstitution capabilities. Develop modeling and simulation (M&S) capabilities, and engineering model prototypes for hardware/software integration and testing to reduce risk and mature technologies applicable to future systems and architectures. Develop sensor ground test bed incorporating M&S software, breadboards/brassboards, test equipment, and data reduction software to provide an evaluation capability for prototype systems and hardware. The test bed will validate/verify requirements and ensure technical maturity for next-gen payload technologies as well as threat mitigation components and techniques.

FY 2019 Plans:

Continue prototyping resilient hardware and maturing critical technologies that include large format FPAs, resilient FPAs, resilient processing algorithms, pointing mirrors, threat warning sensors, and processors. Continue to develop technology options to address emerging threats and stressing targets to current and future OPIR systems. Continue to develop and space qualify emerging technologies to reduce risk for SBIRS and future OPIR programs. Continue to develop system resiliency and advanced technology concepts via ground and on-orbit demos in order to validate requirements, demonstrate performance, develop CONOPS, and prove enhanced system capabilities. Continue the integration of sensor test bed components and begin resiliency tests in sensor ground test bed.

FY 2020 Plans:

Continue prototyping resilient hardware and maturing critical technologies that include large format FPAs, resilient FPAs, resilient processing algorithms, pointing mirrors, threat sensors, and processors for earliest integration into Next Gen OPIR or similar programs. Continue to develop technology options to address emerging threats and stressing targets to current and future OPIR systems. Continue to develop and space qualify emerging technologies to reduce risk for Next Gen OPIR satellites. Continue to develop system resiliency and advanced technology concepts via ground and on-orbit demos in order to demonstrate performance, develop CONOPS, and prove enhanced system capabilities. Continue the integration of sensor test bed components and resiliency tests in sensor ground test bed. Begin maturation of sensor and bus modularity concepts. Rapidly

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| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
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| <p>respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 decreased compared to FY 2019 by \$27.791M. Justification for this decrease is described in plans above.</p> | | | |
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|---------------------------------|--------|--------|--------|
| Title: Data Exploitation | 68.935 | 66.322 | 59.767 |
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| <p>Description: Exploit existing OPIR data sources (Defense Support Program (DSP), SBIRS Highly Elliptical Orbit (HEO), SBIRS GEO Scanner, SBIRS GEO Starer, SMI and other prototypes, and other sources to include classified through data collection, processing, fusion, data dissemination, algorithm development and testing, network connectivity, and sensor performance assessments. SBIRS and other sensors provide a rich data set for exploitation. SMI data exploitation enables access to raw and processed data for data analysts and application developers to expand capabilities for battlespace awareness and other applications. SMI data exploitation efforts are complementary to, and enhance, the exploitation capabilities delivered by the PoR, prototypes, and inform future PoR exploitation efforts. SMI will develop tools and algorithms to enable users to apply OPIR data to support their mission needs. Data exploitation efforts also evaluate tools for C2, mission management, and MDP for risk reduction to evolve the PoR ground system to an open architecture that could support PoR and other future satellites and payload alternatives. SMI ground system development activities seek to demonstrate the performance of an evolved ground system architecture capable of supporting multi-satellite, multi-payload, multi-mission management and data processing for any infrared payload to achieve lower operating costs with enhanced net-centric and service oriented features along with a flexible expansion capability that was not designed into the current PoR ground system. Support demonstration and prototype architecture planning and experimentation.</p> | | | |
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| <p>FY 2019 Plans: Continue to provide enhanced ground segment capability and tools for C2, data collection, mission processing, and data dissemination to enhance mission resiliency and data exploitation of SBIRS and other OPIR data. Continue to collaborate with Intelligence Community (IC) and MDA to enhance Joint OPIR Ground (JOG) study initiatives. Continue building and expansion of data exploitation lab capability into its final location and support experimentation, technology maturity and evolution of exploitation algorithms. Continue development and expansion of a Battlespace Awareness real-time capability in the OPIR Battlespace Awareness Center (OBAC) that will integrate applications and services matured in the data exploitation government lab. Develop and demonstrate the performance of an evolved ground system architecture to support multi-satellite, multi-payload, multi-mission management and data processing for any infrared payload with enhanced net-centric and service oriented features along with a flexible expansion capability. Incorporate results from WFOV payload calibration into WFOV MDP software. Develop and test WFOV calibration algorithm. Begin preparation for WFOV on-orbit calibration support.</p> | | | |
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| <p>FY 2020 Plans:</p> | | | |
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| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| Continue to provide enhanced ground segment capability and tools for C2, data collection, mission processing, and data dissemination to enhance mission resiliency and data exploitation of SBIRS and other OPIR data. Continue to collaborate with Intelligence Community (IC) and MDA to enhance Joint OPIR Ground (JOG) study initiatives. Complete building and expansion of data exploitation lab capability into its final location and support experimentation, technology maturity and evolution of exploitation algorithms. Continue development and expansion of a Battlespace Awareness real-time capability in the OPIR Battlespace Awareness Center (OBAC) that will integrate applications and services matured in the data exploitation government lab. Continue to develop, expand and manage the common open framework architecture of the data exploitation lab and real-time OBAC capability. Support development of experimental operations and additional uses of the program of record data in the OBAC. Develop prototype processes for managing an open framework architecture and developing applications for the OBAC and transition those processes to the OPIR Next Generation, Future Operationally Resilient Ground Evolution (FORGE). Develop and demonstrate the performance of a Government owned open and extensible evolved ground system architecture to support multi-satellite, multi-payload C2, multi-mission management and data processing for any infrared payload with enhanced net-centric and service oriented features along with a flexible expansion capability. Incorporate results from WFOV payload calibration into WFOV MDP software. Develop and test WFOV calibration algorithm and execute the WFOV on-orbit calibration. Support demonstration and prototype architecture planning and experimentation. | | | |
| <i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> FY 2020 decreased compared to FY 2019 by \$6.555M. Justification for this decrease is described in plans above. | | | |
| Accomplishments/Planned Programs Subtotals | 173.584 | 186.556 | 205.723 |

| C. Other Program Funding Summary (\$ in Millions) | | | | | | | | | | | |
|---|----------------|----------------|-------------------------|------------------------|--------------------------|----------------|----------------|----------------|----------------|-----------------------------|-------------------|
| Line Item | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| • SPAF 01 Line 13: <i>MSSBIR: SBIR High (Space)</i> | 929.058 | 108.397 | 233.952 | - | 233.952 | 176.065 | 55.188 | 8.340 | 8.490 | Continuing | Continuing |
| • RDTE 05 1206441F: <i>Space Based Infrared System (SBIRS) High EMD</i> | 0.000 | 10.129 | 0.000 | - | 0.000 | - | - | - | - | 0.000 | 10.129 |

Remarks

D. Acquisition Strategy

The program office will use a variety of acquisition approaches to execute various concept studies, technology maturation efforts, testbed/prototype demonstrations, and data exploitation initiatives and projects. The program office will collaborate with appropriate contracting agencies to support each individual effort. Data exploitation efforts in the laboratory and the Battlespace Awareness center will leverage existing external contracts, as well as new internal competitive contracts. Activities, such as SBIRS obsolescence and affordability enhancements to the existing satellite design, will leverage existing Program of Record contracts. Technology maturation and component prototyping and/or qualification could leverage existing contracts. Broad Agency Announcements (BAAs), and Other Transaction Authorities; in fact

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many are planned in collaboration with Air Force Research Lab (AFRL) and other government agencies. Where practical, other efforts could be competed. An SMC BAA will be used to acquire and mature high priority technology items requiring program office control to ensure goals are met. Federally Funded Research and Development Center (FFRDC), University Affiliated Research Centers (UARCs) and Systems Engineering and Technical Assistance (SETA) contractors will also be used to conduct and support studies. New technology, replacement components, and system designs will be acquired with government data rights to the maximum extent to allow their incorporation into any future OPIR satellite production or system development. Contracting partnerships with other agencies will also be used to study, develop, demonstrate and prove emerging capabilities. Funding in execution years will be realigned within the Next Gen OPIR program element to respond to execution requirements.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206442F / <i>Next Generation OPIR</i> |
| Project (Number/Name) 657009 / <i>Space Mod Initiative</i> | |

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
|--|--|
| Demonstrations | |
| Payload Calibration | |
| Space Vehicle Integration and Test | |
| Launch and on-orbit calibration | |
| WFOV On-Orbit Demo | |
| Block 1 Prototype | |
| Development | |
| Build | |
| Integration and Test | |
| Technology Maturation | |
| BAA White Papers & Proposed Review | |
| BAA Awards (annual calls) | |
| Architecture Studies | |
| Component design and test | |
| Data Exploitation | |
| BAA Follow-on | |
| TAP Lab and OBAC Support Services (TLOSS) Contract | |

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206442F / <i>Next Generation OPIR</i> | Project (Number/Name) 657009 / <i>Space Mod Initiative</i> |
|--|---|--|

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Demonstrations</i> | | | | |
| Payload Calibration | 1 | 2019 | 3 | 2019 |
| Space Vehicle Integration and Test | 1 | 2019 | 3 | 2019 |
| Launch and on-orbit calibration | 2 | 2020 | 3 | 2020 |
| WFOV On-Orbit Demo | 4 | 2020 | 4 | 2023 |
| <i>Block 1 Prototype</i> | | | | |
| Development | 3 | 2019 | 2 | 2022 |
| Build | 2 | 2022 | 4 | 2024 |
| Integration and Test | 4 | 2024 | 4 | 2024 |
| <i>Technology Maturation</i> | | | | |
| BAA White Papers & Proposed Review | 1 | 2019 | 2 | 2019 |
| BAA Awards (annual calls) | 2 | 2019 | 4 | 2024 |
| Architecture Studies | 3 | 2019 | 4 | 2019 |
| Component design and test | 1 | 2019 | 4 | 2024 |
| <i>Data Exploitation</i> | | | | |
| BAA Follow-on | 1 | 2018 | 4 | 2024 |
| TAP Lab and OBAC Support Services (TLOSS) Contract | 4 | 2019 | 4 | 2024 |

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|---|--------------------|----------------|----------------|---------------------|---|----------------------|----------------|----------------|--|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 5 | | | | | R-1 Program Element (Number/Name) PE 1206442F / <i>Next Generation OPIR</i> | | | | Project (Number/Name) 657106 / <i>Next-Gen OPIR Ground</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 657106: <i>Next-Gen OPIR Ground</i> | - | 71.018 | 257.865 | 264.768 | 0.000 | 264.768 | 498.453 | 539.678 | 340.490 | 357.950 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

Next-Gen OPIR Ground (Project 657106): Next-Gen OPIR Ground, also known as Future Operationally Resilient Ground Evolution (FORGE), will consist of Command and Control (C2) migration to Air Force Space Command's Enterprise Ground Services (EGS), modernization of Mission Data Processing (MDP), and required development/upgrades to Relay Ground Stations (RGS) to meet AFSPC guidance on the current and future space domain demands. The FORGE effort will implement an open framework for MDP and migration of C2 satellite operations to integrate with EGS. FORGE and EGS efforts will provide the flexibility and scalability to integrate new sensors and capabilities more efficiently in order to meet evolving warfighter needs. The Next-Gen OPIR ground also includes risk reduction efforts to enable cyber enhancements for the PoR and Next-Gen OPIR ground systems. EGS will introduce common ground services such as Telemetry, Tracking and Command (TT&C) and automation. To support initial Next-Gen OPIR Space satellite launches without driving undue risk into the FORGE development schedule, the program will establish a risk reduction ground capability Next-Gen OPIR Interim Operations (NIO) option based on a limited Block 20 solution that can be exercised.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| Title: Next-Gen OPIR Ground | 71.018 | 257.865 | 264.768 |
| Description: Infrastructure modernization and implementation of a Government owned open framework for MDP, migration for C2 of satellite operations onto EGS and required development/upgrades to Relay Ground Stations (RGS). | | | |
| FY 2019 Plans: Complete development of C2 capabilities and transition two SBIRS HEO payloads to EGS. Continue risk reduction phase of FORGE MDP with framework prototype and begin MDP application provider prototype. Initial demonstration of the framework prototype with subset of mission applications. These efforts provide initial open architecture capabilities, standardized interfaces across multiple space missions, a resilient cyber defense, and a system that is prepared to meet evolving user and warfighter needs. MDP which began in FY2018 will ramp up starting in FY2019. Begin risk reduction efforts to current ground statuses to enable Next-Gen OPIR system, accelerate FORGE activities, and implement cyber modernization for EGS. Continue program office support and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc. | | | |
| FY 2020 Plans: Continue competitive MDP applications provider prototype that will utilize the FORGE MDP framework. Continue work on first GEO C2 transition to EGS. Continue work on Next-Gen GEO ground software development for integration into EGS and FORGE MDP. Assess need for continued development of Next Gen Interim Operations (NIO) risk reduction effort. Continue FORGE accelerated activity for RGS build out. Rapidly respond to implement system resiliency and situational awareness necessary | | | |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206442F / <i>Next Generation OPIR</i> | Project (Number/Name) 657106 / <i>Next-Gen OPIR Ground</i> |
|--|---|--|

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|---------|---------|---------|
| to operate in the contested space domain. These activities may include, but are not limited to program office support, studies, technical analysis, prototyping, etc. | | | |
| <i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> FY2020 increased compared to FY 2019 by \$6.903M. Justification for this increase includes a refined acquisition strategy that delivers an enterprise ground system to support operations of Next Gen OPIR by 2025. | | | |
| Accomplishments/Planned Programs Subtotals | 71.018 | 257.865 | 264.768 |

C. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

D. Acquisition Strategy

FORGE is initially operating as an enterprise architecture development program with plans to present a formal acquisition strategy and request 804 authorities from SAF/AQ in late FY2019. Utilize existing Space and Missile Systems Center (SMC) contracts to transition SBIRS C2 satellite operations to EGS. Compete a MDP framework provider and MDP applications provider. EGS infrastructure modernization and FORGE MDP will introduce competition into OPIR ground systems with an emphasis to onramp to EGS as soon as practical. NIO is being acquired as part of the Next-Gen GEO Block 0 contract. RGS(s) will be developed utilizing a combination of existing and future contracts as applicable. Funding in execution years will be realigned within the Next-Gen OPIR program element to respond to execution requirements.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206442F / Next Generation OPIR | Project (Number/Name) 657106 / Next-Gen OPIR Ground |
|--|--|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Next-Gen OPIR Ground | Various | Various : Various | - | 56.683 | May 2018 | 214.908 | Oct 2018 | 224.998 | Oct 2019 | - | | 224.998 | Continuing | Continuing | - |
| Enterprise SE&I | C/CPAF | Engility Corp. : Andover, MA | - | 2.137 | Jun 2018 | 9.168 | Nov 2018 | 6.000 | Nov 2019 | - | | 6.000 | Continuing | Continuing | - |
| Technical Mission Analysis | RO | Aerospace Corporation : El Segundo, CA | - | 2.137 | Jun 2018 | 9.453 | Oct 2018 | 8.306 | Oct 2019 | - | | 8.306 | Continuing | Continuing | - |
| Subtotal | | | - | 60.957 | | 233.529 | | 239.304 | | - | | 239.304 | Continuing | Continuing | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| FFRDC | RO | Aerospace Corporation : El Segundo, CA | - | 4.052 | Jun 2018 | 6.158 | Oct 2018 | 5.481 | Oct 2019 | - | | 5.481 | Continuing | Continuing | - |
| A&AS | Various | Various : Various | - | 1.584 | Aug 2018 | 13.021 | Feb 2019 | 14.688 | Feb 2020 | - | | 14.688 | Continuing | Continuing | - |
| Other Support | Various | Various : Various | - | 4.425 | Jun 2018 | 5.157 | Oct 2018 | 5.295 | Oct 2019 | - | | 5.295 | Continuing | Continuing | - |
| Subtotal | | | - | 10.061 | | 24.336 | | 25.464 | | - | | 25.464 | Continuing | Continuing | N/A |

| | | | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|--|--|--------------------|----------------|----------------|---------------------|--------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Project Cost Totals | | | - | 71.018 | 257.865 | 264.768 | - | 264.768 | Continuing | Continuing | N/A |

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|--|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206442F / <i>Next Generation OPIR</i> | Project (Number/Name) 657106 / <i>Next-Gen OPIR Ground</i> |
|--|---|--|

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
|--|--|
| FORGE - EGS/C2 | |
| SBIRS HEO 1 & 2 Development | |
| 1 SBIRS GEO on EGS | |
| Next-Gen OPIR GEO | |
| SBIRS Constellation | |
| FORGE - MDP | |
| Competitive Prototype Framework Development | |
| Next-Gen OPIR GEO MDP Development Sensor Specific Processing (SSP) and Verification & Validation (V&V) | |
| Competitive Prototype Applications Provider | |
| Follow-on Prototype Framework Development | |
| Follow-on Prototype Applications Provider Development | |
| Next-Gen Interim Operations (NIO) (Risk Reduction Option) | |
| NIO Development | |
| Relay Ground Stations (RGS) | |
| RGS Development | |

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|--|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206442F / <i>Next Generation OPIR</i> | Project (Number/Name) 657106 / <i>Next-Gen OPIR Ground</i> |
|--|---|--|

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>FORGE - EGS/C2</i> | | | | |
| SBIRS HEO 1 & 2 Development | 1 | 2018 | 3 | 2019 |
| 1 SBIRS GEO on EGS | 2 | 2019 | 2 | 2021 |
| Next-Gen OPIR GEO | 1 | 2019 | 4 | 2023 |
| SBIRS Constellation | 1 | 2021 | 4 | 2023 |
| <i>FORGE - MDP</i> | | | | |
| Competitive Prototype Framework Development | 4 | 2018 | 3 | 2020 |
| Next-Gen OPIR GEO MDP Development Sensor Specific Processing (SSP) and Verification & Validation (V&V) | 2 | 2019 | 3 | 2022 |
| Competitive Prototype Applications Provider | 2 | 2020 | 3 | 2021 |
| Follow-on Prototype Framework Development | 2 | 2020 | 4 | 2024 |
| Follow-on Prototype Applications Provider Development | 3 | 2021 | 4 | 2024 |
| <i>Next-Gen Interim Operations (NIO) (Risk Reduction Option)</i> | | | | |
| NIO Development | 4 | 2018 | 4 | 2023 |
| <i>Relay Ground Stations (RGS)</i> | | | | |
| RGS Development | 3 | 2019 | 4 | 2024 |

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|---|--------------------|----------------|----------------|---------------------|--|----------------------|----------------|----------------|---|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 5 | | | | | R-1 Program Element (Number/Name) PE 1206442F / Next Generation OPIR | | | | Project (Number/Name) 657120 / Next-Gen OPIR Space, Block 0 GEO | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 657120: Next-Gen OPIR Space, Block 0 GEO | - | 185.611 | 198.705 | 817.383 | 0.000 | 817.383 | 969.220 | 1,157.467 | 1,331.302 | 1,316.920 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

Next-Gen OPIR Space Block 0 GEO (Project 657120): The primary mission is to provide initial missile warning of a ballistic missile attack on the US, deployed forces and allies. The Next-Gen OPIR GEO missile warning satellites enhance detection and improve reporting of intercontinental ballistic missile launches, submarine ballistic missile launches, and tactical ballistic missile launches. Development consists of new payloads in a highly resilient bus, providing real-time persistent global infrared coverage to meet validated JROC requirements on current and future space domain demands.

The Program Office intends to acquire the NGG capability in two contract actions. Phase 1 awarded in August 2018 and encompasses requirements analysis, design/development, critical path flight hardware procurement, and risk reduction efforts leading to a System Critical Design Review (CDR). Phase 2 will be awarded for the manufacturing, assembly, system integration and test, launch and early on-orbit test through the delivery of NGGs 1-3 for operational acceptance of each space vehicle.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| Title: Next-Gen OPIR Space, Block 0 GEO | 185.611 | 198.705 | 817.383 |
| Description: Development of the Next-Gen OPIR GEO missile warning satellites with a proven bus, new hardened sensors, and auxiliary payloads for increased resilience. The space segment for GEO missile warning satellites consist of a resilient architecture, providing real time persistent global (with exception of northern hemisphere) infrared coverage. The first GEO satellite is required in FY2025. | | | |
| FY 2019 Plans: Acquire Next Gen OPIR GEO satellites. Continue maturing payload design for satellite systems that meet new missile warning requirements balancing affordability, capability, and resiliency requirements. Develop a PDR-level design and initiate detailed design in preparation for CDR, risk reduction and purchase of flight components. Continue program office support and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc. | | | |
| FY 2020 Plans: Will continue to perform requirements analysis, design/development, critical path flight hardware procurement, and risk reduction efforts leading to a System Critical Design Review (CDR) for GEO satellites. Continue maturing payload design and resiliency related re-design of the LMS A2100 Tech Refresh SV. Mature the PDR-level design into a detailed design for a SV CDR and System CDR by FY2021 for risk reduction, and purchase the remaining critical flight components. Modify the LMS Phase 1 contract to finish the manufacture, build, integration, test, and launch of GEO SVs. Rapidly respond to implement system | | | |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206442F / <i>Next Generation OPIR</i> | Project (Number/Name) 657120 / <i>Next-Gen OPIR Space, Block 0 GEO</i> |

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| resiliency and situational awareness necessary to operate in the contested space domain. These activities may include, but are not limited to program office support, studies, technical analysis, prototyping, etc. | | | |
| <i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> FY 2020 increased compared to FY 2019 by \$618.678M. Justification for this increase is described in plans above. | | | |
| Accomplishments/Planned Programs Subtotals | 185.611 | 198.705 | 817.383 |

C. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

D. Acquisition Strategy

The Air Force intends to acquire Next-Gen systems in block developments to deliver the required constellation. The first block, Block 0, consists of 3 Next-Gen GEO and 2 Next-Gen Polar satellites. The Next-Gen OPIR Space program has been declared a Section 804 Rapid Prototype effort under the 2016 National Defense Authorization Act (NDAA). The first GEO is required by FY 2025, and the first Polar satellite is required in FY 2027. All five Block 0 satellites need to be on orbit by FY 2029. The program office awarded two sole source contracts (one to a GEO prime and one to a Polar prime) under the authority of two class Justification & Authorization documents. Next-Gen GEO Phase 1 was awarded in FY 2018, encompassing requirements analysis, design/development, critical path flight hardware procurement, and risk reduction efforts leading to a System Critical Design Review. Next-Gen GEO Phase 2 will be awarded (FY 2020 timeframe) as a modification to the Phase 1 contract. This will complete the manufacturing, assembly, system integration and test, launch and early on-orbit test through the delivery of GEOs 1-3 for operational acceptance of each space vehicle. The Air Force plans to acquire subsequent blocks in a competitive environment. The Block 1 satellites will be based on an approved Enterprise OPIR Capability Development Document. Funding in execution years will be realigned within the Next-Gen OPIR program element to respond to execution requirements.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206442F / Next Generation OPIR | Project (Number/Name) 657120 / Next-Gen OPIR Space, Block 0 GEO |
|--|--|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Next-Gen OPIR Space, Block 0 GEO | SS/CPPIF | Lockheed Martin : Sunnyvale, CA | - | 165.381 | Aug 2018 | 167.496 | Oct 2018 | 766.700 | Oct 2019 | - | | 766.700 | Continuing | Continuing | - |
| Enterprise SE&I | C/CPAF | Engility Corp. : El Segundo, CA | - | 4.158 | Jun 2018 | 5.672 | Nov 2018 | 8.491 | Nov 2019 | - | | 8.491 | Continuing | Continuing | - |
| Technical Mission Analysis | RO | Aerospace Corp. : El Segundo, CA | - | 3.574 | Jun 2018 | 7.695 | Oct 2018 | 9.699 | Oct 2019 | - | | 9.699 | Continuing | Continuing | - |
| Subtotal | | | - | 173.113 | | 180.863 | | 784.890 | | - | | 784.890 | Continuing | Continuing | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| FFRDC | RO | Aerospace Corp. : El Segundo, CA | - | 4.136 | Jun 2018 | 2.534 | Oct 2018 | 3.194 | Oct 2019 | - | | 3.194 | Continuing | Continuing | - |
| A&AS | Various | Various : Various | - | 3.362 | Aug 2018 | 10.441 | Feb 2019 | 12.374 | Feb 2019 | - | | 12.374 | Continuing | Continuing | - |
| Other Support | Various | Various : Various | - | 5.000 | | 4.867 | Oct 2018 | 16.925 | Oct 2018 | - | | 16.925 | Continuing | Continuing | - |
| Subtotal | | | - | 12.498 | | 17.842 | | 32.493 | | - | | 32.493 | Continuing | Continuing | N/A |

| Project Cost Totals | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|--------------------|----------------|----------------|---------------------|--------------------|----------------------|-------------------------|-------------------|---------------------------------|
| | - | 185.611 | 198.705 | 817.383 | - | 817.383 | Continuing | Continuing | N/A |

Remarks

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206442F / Next Generation OPIR | Project (Number/Name) 657120 / Next-Gen OPIR Space, Block 0 GEO |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------------------|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| Phase 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Phase I ATP | | | | ■ | | | | | | | | | | | | | | | | | | | | | | | | |
| SRR | | | | | | | ■ | | | | | | | | | | | | | | | | | | | | | |
| SV PDR | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SV CDR | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Phase 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bus Development | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Payload Development | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Phase 2 ATP | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206442F / <i>Next Generation OPIR</i> | Project (Number/Name) 657120 / <i>Next-Gen OPIR Space, Block 0 GEO</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|-----------------------|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| Phase 1 | | | | |
| Phase I ATP | 4 | 2018 | 4 | 2018 |
| SRR | 2 | 2019 | 2 | 2019 |
| SV PDR | 4 | 2019 | 4 | 2019 |
| SV CDR | 4 | 2021 | 4 | 2021 |
| Phase 2 | | | | |
| Bus Development | 2 | 2019 | 2 | 2024 |
| Payload Development | 2 | 2019 | 4 | 2024 |
| Phase 2 ATP | 2 | 2021 | 2 | 2021 |

Note
Next-Gen OPIR Space, Block 0 GEO efforts continue past 2024.

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|---|--------------------|----------------|----------------|---------------------|--|----------------------|----------------|----------------|---|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 5 | | | | | R-1 Program Element (Number/Name) PE 1206442F / Next Generation OPIR | | | | Project (Number/Name) 657121 / Next-Gen OPIR Space, Block 0 Polar | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 657121: Next-Gen OPIR Space, Block 0 Polar | - | 9.284 | 0.000 | 107.404 | 0.000 | 107.404 | 312.116 | 389.826 | 581.843 | 579.207 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

Note

Created new Project 657121 Next-Gen OPIR Space, Block 0 Polar for transparency between efforts.

A. Mission Description and Budget Item Justification

Next-Gen OPIR Space, Block 0 Polar (Project 657121): The primary mission is to provide initial missile warning of a ballistic missile attack on the US, its deployed forces and its allies. Next-Gen OPIR-Space enhances detection and improves reporting of intercontinental ballistic missile launches, submarine launched ballistic missile launches, and tactical ballistic missile launches. Development consists of the Next-Gen OPIR Polar missile warning satellites with new payloads in a highly resilient bus, providing real-time persistent global infrared coverage to meet validated JROC requirements on current and future space domain demands.

The Program Office intends to acquire the Next Gen OPIR Polar (NGP) capability in three contract actions. Phase 0 awarded in June 2018, encompassing system and payload requirements analysis and risk reduction efforts leading to a System Requirements Review. Phase 1 will be awarded for design and development, critical path flight hardware procurement, and risk reduction efforts leading to a System Critical Design Review. Phase 2 will be awarded for the manufacturing, assembly, integration and test, and delivery of NGP satellites 1&2.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| Title: Next-Gen OPIR Space, Block 0 Polar | 9.284 | 0.000 | 107.404 |
| Description: Development of the Next-Gen OPIR Polar missile warning satellites with a proven bus with modifications and auxiliary payloads for improved resiliency, and new hardened sensors. The Polar space segment will consist of two Next-Gen OPIR Polar satellites in a resilient architecture, providing real time persistent infrared coverage of the northern hemisphere. | | | |
| FY 2019 Plans: N/A | | | |
| FY 2020 Plans: Will continue maturing payload and bus requirements for satellite systems that meet new missile warning requirements balancing affordability, capability, and resiliency requirements. Conduct SRR and begin preliminary design in preparation for PDR. Award follow-on contract for design, long lead parts procurement, development and risk reduction efforts leading to system CDR. Rapidly respond to incorporate system resiliency and situational awareness requirements necessary to operate in the contested | | | |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206442F / <i>Next Generation OPIR</i> | Project (Number/Name) 657121 / <i>Next-Gen OPIR Space, Block 0 Polar</i> |

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| space domain. These activities may include, but are not limited to program office support, studies, technical analysis, prototyping etc. <i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> FY2020 increased compared to FY2019 by \$107.404M. Justification for this increase is to meet the requirement to deliver two polar satellites by 2029. Acceleration of the program requires significant early funding for bus and payload development to meet warfighter requirements. | | | |
| Accomplishments/Planned Programs Subtotals | 9.284 | 0.000 | 107.404 |

C. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

D. Acquisition Strategy

The Air Force intends to acquire Next Gen systems in block developments to deliver the required constellation. The first block, Block 0, consists of three Next-Gen GEO and two Next-Gen Polar satellites. The Next Gen OPIR Space program has been declared a Section 804 Rapid Prototype effort under the 2016 National Defense Authorization Act (NDAA). The first GEO is required by FY2025, and the first Polar satellite is required in FY2027. All five Block 0 satellites need to be on orbit by FY2029. The program office awarded two sole source contracts (one to a GEO prime and one to a Polar prime) under the authority of two class Justification & Authorization documents. The Air Force plans to acquire subsequent blocks in a competitive environment. The Block 1 satellites will be based on an approved Enterprise OPIR Capability Development Document. Funding in execution years will be realigned within the Next-Gen OPIR program element to respond to execution requirements.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206442F / Next Generation OPIR | Project (Number/Name) 657121 / Next-Gen OPIR Space, Block 0 Polar |
|--|--|---|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Next-Gen OPIR Space, Block 0 Polar | SS/CPAF | Northrop Grumman : Redondo Beach, CA | - | 5.486 | Jun 2018 | 0.000 | | 91.124 | Oct 2019 | - | | 91.124 | Continuing | Continuing | - |
| Enterprise SE&I | C/CPAF | Engility Corp. : El Segundo, CA | - | 0.120 | Jun 2018 | 0.000 | | 2.674 | Nov 2019 | - | | 2.674 | Continuing | Continuing | - |
| Technical Mission Analysis | RO | Aerospace Corp. : El Segundo, CA | - | 0.608 | Jun 2018 | 0.000 | | 4.718 | Oct 2019 | - | | 4.718 | Continuing | Continuing | - |
| Subtotal | | | - | 6.214 | | 0.000 | | 98.516 | | - | | 98.516 | Continuing | Continuing | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|-----------------------------------|---|--------------------|----------------|-------------------|----------------|-------------------|---------------------|-------------------|--------------------|-------------------|----------------------|-------------------------|-------------------|---------------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| FFRDC | RO | Aerospace Corp. : El Segundo, CA | - | 0.275 | Jun 2018 | 0.000 | | 1.554 | Oct 2019 | - | | 1.554 | Continuing | Continuing | - |
| A&AS | Various | Various : Various | - | 2.795 | Aug 2018 | 0.000 | | 5.186 | Feb 2019 | - | | 5.186 | Continuing | Continuing | - |
| Other Support | Various | Various : Various | - | 0.000 | | 0.000 | | 2.148 | Oct 2018 | - | | 2.148 | Continuing | Continuing | - |
| Subtotal | | | - | 3.070 | | 0.000 | | 8.888 | | - | | 8.888 | Continuing | Continuing | N/A |

| Project Cost Totals | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|--------------------|----------------|----------------|---------------------|--------------------|----------------------|-------------------------|-------------------|---------------------------------|
| | - | 9.284 | 0.000 | 107.404 | - | 107.404 | Continuing | Continuing | N/A |

Remarks

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206442F / <i>Next Generation OPIR</i> | Project (Number/Name) 657121 / <i>Next-Gen OPIR Space, Block 0 Polar</i> |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | | |
|-------------------------------------|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|--|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | |
| Phase 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Phase 0 ATP | | | ■ | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Requirements Development & Analysis | | | ■ | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SRR | | | | | | | | | | ■ | | | | | | | | | | | | | | | | | | | |
| Phase 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Phase 1 ATP | | | | | | | | | | ■ | | | | | | | | | | | | | | | | | | | |
| Payload & Bus Development | | | | | | | | | | ■ | | | | | | | | | | | | | | | | | | | |
| PDR | | | | | | | | | | | | | | ■ | | | | | | | | | | | | | | | |
| CDR | | | | | | | | | | | | | | | | | | ■ | | | | | | | | | | | |
| Phase 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Phase 2 ATP | | | | | | | | | | | | | | | | | | ■ | | | | | | | | | | | |
| Assembly, Integration & Test | | | | | | | | | | | | | | | | | | ■ | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206442F / <i>Next Generation OPIR</i> | Project (Number/Name) 657121 / <i>Next-Gen OPIR Space, Block 0 Polar</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|-------------------------------------|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| Phase 0 | | | | |
| Phase 0 ATP | 3 | 2018 | 3 | 2018 |
| Requirements Development & Analysis | 3 | 2018 | 3 | 2020 |
| SRR | 2 | 2020 | 2 | 2020 |
| Phase 1 | | | | |
| Phase 1 ATP | 2 | 2020 | 2 | 2020 |
| Payload & Bus Development | 3 | 2020 | 3 | 2022 |
| PDR | 3 | 2021 | 3 | 2021 |
| CDR | 3 | 2022 | 3 | 2022 |
| Phase 2 | | | | |
| Phase 2 ATP | 3 | 2022 | 3 | 2022 |
| Assembly, Integration & Test | 4 | 2022 | 4 | 2024 |

Note

Next-Gen OPIR Polar efforts continue past 2024

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 1206445F / <i>Commercial SATCOM (COMSATCOM) Integration</i> |
|---|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 0.000 | 49.500 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 49.500 |
| 650140: <i>COMSATCOM</i> | - | 0.000 | 49.500 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 49.500 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | - | - |

Note
The DoD Appropriations Act, 2019, directed a transfer of \$49.5 million Space Procurement, Air Force (SPAF) from Wideband Gapfiller Satellites (Space) to a new RDT&E, AF line. PE 1206445F, Commercial SATCOM (COMSATCOM) Integration, Project 650140, COMSATCOM, fulfills this intent.

A. Mission Description and Budget Item Justification

The subject Research, Development, Test and Evaluation (RDT&E) funds will be executed from Headquarters Air Force Space Command (AFSPC) and will be used to advance mission-critical COMSATCOM capabilities, thereby enabling transformation of AFSPC's SATCOM enterprise by ensuring RDT&E investments have utility and portability between Military SATCOM (MILSATCOM) and COMSATCOM requirements. These three activities include: COMSATCOM financial and customer tools development and migration from the Defense Information Systems Agency (DISA) to Air Force systems; development of enhanced COMSATCOM acquisition capabilities; and enterprise innovation development activities focused on transforming and integrating the four principle layers of a SATCOM service - space, terminal, network, and management and control - as well as governance structures needed to normalize enterprise capabilities.

The Air Force has determined that an enterprise approach to the procurement, delivery, and management of its SATCOM capabilities is the best means to create an environment that is responsive to Combatant Commanders and other users across the spectrum of conflict. In addition, an enterprise approach will improve affordability and mission assurance. The COMSATCOM PE will start this process. COMSATCOM Integration will establish an Enterprise Program of Record (POR) that incorporates COMSATCOM, MILSATCOM, and International partners into a hybrid architecture.

Space acquisition must respond with speed and agility to emerging adversary threats. AFSPC is transforming the organization and implementation of space acquisition to an enterprise approach, maximizing innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, AFSPC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose capabilities.

This PE may include necessary civilian pay expenses required to manage, execute and deliver Commercial SATCOM in a single Enterprise architecture. The use of such funds would be in addition to the civilian pay expenses budgeted in PEs 1206392F and 1206398F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 1206445F / <i>Commercial SATCOM (COMSATCOM) Integration</i> |
|---|--|

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Current President's Budget | 0.000 | 49.500 | 0.000 | 0.000 | 0.000 |
| Total Adjustments | 0.000 | 49.500 | 0.000 | 0.000 | 0.000 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 49.500 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Change Summary Explanation

FY2019: \$49.5M Congressional Directed Transfer from GAP000/Wideband Gapfiller Satellites SPAF to a new COMSATCOM RDT&E, AF line.

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| Title: COMSATCOM Financial and Customer Tools Development and Migration | 0.000 | 15.000 | 0.000 |
| Description: This activity will transition the existing COMSATCOM customer-facing tools and background financial management data systems from DISA services to the Air Force. These must be migrated to Air Force systems in order to continue the transition of responsibilities associated with AFSPC's sole procurement authorities. A new system of tools is required to automate and securely distribute COMSATCOM acquisition and utilization of information to stakeholders, and to also reproduce and enhance the ordering, billing, activation, and provisioning, and other financial management tasks presently provided by DISA. | | | |
| FY 2019 Plans: Initiate activities that shall solicit proposals on/about 3Q FY 2019 and resultant contract(s) is estimated to be awarded on/about 4Q FY 2019 with all funds obligated at that time. Delivery of the various tools is expected to occur by 4Q FY2020. | | | |
| FY 2020 Plans: N/A. | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: | | | |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | | R-1 Program Element (Number/Name) PE 1206445F <i>I Commercial SATCOM (COMSATCOM) Integration</i> | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| FY 2020 decreased compared to FY 2019 by \$15.0M. No funding is requested in FY 2020. | | | | |
| <p>Title: Development of Enhanced COMSATCOM Procurement Capabilities</p> <p>Description: This project will consolidate lessons learned to develop a future COMSATCOM acquisition methodology that normalizes demonstrated savings potentials, closes operational gaps, and pursues increased end-user readiness, flexibility, and responsiveness. Specific to this task is research on legal and/or policy allowances that previously have not been exploited, as well as provisions that, if changed, further SATCOM acquisition transformation.</p> <p>FY 2019 Plans: FY2019 Plans: Initiate activities that shall solicit proposals on/about 3Q FY 2019 and resultant contract(s) is estimated to be awarded on/about 4Q FY 2019 with all funds obligated at that time. Deliverable is an acquisition strategy artifact, and shall be completed by 3Q FY 2020.</p> <p>FY 2020 Plans: N/A.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 decreased compared to FY 2019 by \$6.0M. No funding is requested in FY 2020.</p> | | 0.000 | 6.000 | 0.000 |
| <p>Title: Enterprise Innovation Efforts</p> <p>Description: This effort advances enterprise development in the four layers of a SATCOM capability, along with the overarching governance structure necessary to enable ubiquitous service capability, awareness, control, and assessment. Informed by AFSPC's Enterprise SATCOM Strategy, which is currently under development and to be completed in FY 2019, the effort will investigate AFSPC's ability to influence commercial satellite systems, technologies, services, and architectures, with keen attention towards applicability across the SATCOM enterprise. Examples of focus areas include, but are not limited to: Enterprise Management & Control; Bandwidth Pooling; Terminal Flexibility; and Managed Services.</p> <p>FY 2019 Plans: Initiate development and demonstration activities leading to delivery of capabilities that meet the Air Force's enterprise SATCOM needs as outlined in its forthcoming Enterprise SATCOM Vision and Strategy.</p> <p>FY 2020 Plans: N/A.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p> | | 0.000 | 28.500 | 0.000 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 1206445F / <i>Commercial SATCOM (COMSATCOM) Integration</i> |
|---|--|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|---------|---------|---------|
| FY 2020 decreased compared to FY 2019 by \$28.5M. No funding is requested in FY 2020. | | | |
| Accomplishments/Planned Programs Subtotals | 0.000 | 49.500 | 0.000 |

D. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

E. Acquisition Strategy

The strategy/plan is to do multiple competitive awards.

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|--|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206445F / <i>Commercial SATCOM</i> (COMSATCOM) Integration | Project (Number/Name) 650140 / COMSATCOM |
|--|---|--|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| COMSATCOM Financial and Customer Tools Development and Migration | TBD | TBD : TBD | - | - | | 15.000 | Jun 2019 | - | | - | | - | 0.000 | 15.000 | - |
| Development of Enhanced COMSATCOM Procurement Capabilities | TBD | TBD : TBD | - | - | | 6.000 | Jun 2019 | - | | - | | - | 0.000 | 6.000 | - |
| Enterprise Innovation Efforts | TBD | TBD : TBD | - | - | | 24.470 | Jun 2019 | - | | - | | - | 0.000 | 24.470 | - |
| Subtotal | | | - | - | | 45.470 | | - | | - | | - | 0.000 | 45.470 | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| FFRDC | MIPR | Aerospace Corp : Various | - | - | | 1.450 | Mar 2019 | - | | - | | - | 0.000 | 1.450 | - |
| A&AS | Various | Various : Various | - | - | | 2.500 | Mar 2019 | - | | - | | - | 0.000 | 2.500 | - |
| Other | Various | Various : Various | - | - | | 0.080 | Mar 2019 | - | | - | | - | 0.000 | 0.080 | - |
| Subtotal | | | - | - | | 4.030 | | - | | - | | - | 0.000 | 4.030 | N/A |

| | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract | |
|----------------------------|-------------|---------|---------|--------------|-------------|---------------|------------------|------------|--------------------------|-----|
| Project Cost Totals | | - | - | 49.500 | - | - | - | 0.000 | 49.500 | N/A |

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| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206445F / <i>Commercial SATCOM</i> (COMSATCOM) <i>Integration</i> | Project (Number/Name) 650140 / <i>COMSATCOM</i> |

| FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | |
|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

| | |
|--|--|
| COMSATCOM Tools | |
| COMSATCOM Tools Contract Award | ██████████ |
| COMSATCOM Tools Contract Execution | ██ |
| Enhanced COMSATCOM Procurement | |
| Enhanced COMSATCOM Procurement Contract Award | ██████████ |
| Enhanced COMSATCOM Procurement Contract Execution | ██ |
| Enterprise Innovation Efforts | |
| Enterprise Innovation Efforts projects identification/requirements | ██████████ |
| Enterprise Innovation Efforts projects vendor bid/awards | ██████████ |
| Enterprise Innovation Efforts projects execution | ██ |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206445F / <i>Commercial SATCOM</i> (COMSATCOM) <i>Integration</i> | Project (Number/Name) 650140 / <i>COMSATCOM</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| COMSATCOM Tools | | | | |
| COMSATCOM Tools Contract Award | 3 | 2019 | 3 | 2019 |
| COMSATCOM Tools Contract Execution | 3 | 2019 | 3 | 2020 |
| Enhanced COMSATCOM Procurement | | | | |
| Enhanced COMSATCOM Procurement Contract Award | 3 | 2019 | 3 | 2019 |
| Enhanced COMSATCOM Procurement Contract Execution | 3 | 2019 | 4 | 2020 |
| Enterprise Innovation Efforts | | | | |
| Enterprise Innovation Efforts projects identification/requirements | 2 | 2019 | 2 | 2019 |
| Enterprise Innovation Efforts projects vendor bid/awards | 3 | 2019 | 3 | 2019 |
| Enterprise Innovation Efforts projects execution | 3 | 2019 | 4 | 2020 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 1206853F / <i>National Security Space Launch Program (SPACE) - EMD</i> |
|---|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | 865.879 | 381.877 | 443.035 | 432.009 | 0.000 | 432.009 | 561.163 | 287.258 | 221.656 | 87.200 | 0.000 | 3,280.077 |
| 650006: <i>Next Generation Launch System Investment</i> | 865.879 | 381.877 | 443.035 | 432.009 | 0.000 | 432.009 | 561.163 | 287.258 | 221.656 | 87.200 | 0.000 | 3,280.077 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | - | - |

Program MDAP/MAIS Code: 176

Note

- Prior year funding shown in Cost Table are FY 2014 - FY 2017 and was executed in Program Element (PE) 0604853F.
- Per FY 2019 National Defense Authorization Act, the Evolved Expendable Launch Vehicle (EELV) program will be renamed the National Security Space Launch (NSSL) program, effective 1 March 2019.

A. Mission Description and Budget Item Justification

The National Security Space Launch (NSSL) program is a space launch system that satisfies the government's National Launch Forecast (NLF) requirements to place National Security Space (NSS) space vehicles on orbit. NSSL is a launch service, not a weapon system, which is primarily funded with production funds.

This program, started late FY 2014, funds research and development activities and related studies, includes, but not limited to, items necessary to invest in new and/or upgraded launch systems and associated launch facilities to meet NSS launch needs leveraging two or more domestic commercial providers.

The Air Force is investing in Launch Service Agreement (LSA) public-private partnerships for the development of new and/or upgraded domestic launch systems with commercial launch providers. The end goal is two or more domestic, commercial launch providers that meet all NSS launch requirement needs. In addition, the Air Force is continuing a technical maturation program to address the highest risks for rocket propulsion system (RPS) development. Development of the required RPSs will continue under the LSA public-private partnerships.

Space acquisition must respond with speed and agility to emerging adversary threats. Space and Missile Systems Center (SMC) is transforming the organization and implementation of space acquisition to an enterprise approach, maximizing innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or re-purpose capabilities.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver NSSL system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392F and 1206398F.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | R-1 Program Element (Number/Name) PE 1206853F / <i>National Security Space Launch Program (SPACE) - EMD</i> |
|---|---|

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 297.572 | 245.447 | 196.409 | 0.000 | 196.409 |
| Current President's Budget | 381.877 | 443.035 | 432.009 | 0.000 | 432.009 |
| Total Adjustments | 84.305 | 197.588 | 235.600 | 0.000 | 235.600 |
| • Congressional General Reductions | -1.871 | -2.412 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 100.000 | 200.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -13.824 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 235.600 | 0.000 | 235.600 |

Congressional Add Details (\$ in Millions, and Includes General Reductions)

Project: 650006: *Next Generation Launch System Investment*

Congressional Add: *Launch Service Agreement Congressional Add*

Congressional Add Subtotals for Project: 650006

Congressional Add Totals for all Projects

| | FY 2018 | FY 2019 |
|---|----------------|----------------|
| | 100.000 | 200.000 |
| Congressional Add Subtotals for Project: 650006 | 100.000 | 200.000 |
| Congressional Add Totals for all Projects | 100.000 | 200.000 |

Change Summary Explanation

Both the FY 2018 and FY 2019 Congressional Adds were overall program increases.

FY 2020 program increased by \$235.6M to properly execute the Launch Service Agreements.

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| Title: Rocket Propulsion System Development | 20.000 | 0.000 | 37.500 |

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| | | | | |
|---|--|---|----------------|----------------|
| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i> | | R-1 Program Element (Number/Name) PE 1206853F / <i>National Security Space Launch Program (SPACE) - EMD</i> | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| <p>Description: Continued to invest in a providers of domestic rocket propulsion systems (RPS) under the Launch Service Agreement Other Transaction Authority (OTA) agreements. This investment enables the transition from the use of non-Allied space launch engines to domestic rocket propulsion systems. Continued to execute a single RPS OTA agreement utilizing a public-private partnership.</p> <p>FY 2019 Plans: N/A</p> <p>FY 2020 Plans: Continuing to execute public-private partnership for an industry upper stage engine common to multiple launch service providers, ensuring a domestic, cost-effective solution.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 increase compared to FY 2019 by \$37.500M. Justification for this increase is described in the plans above.</p> | | | | |
| <p>Title: Launch Service Agreement</p> <p>Description: Invest in providers of domestic Launch Services. This investment enables the transition from the use of non-Allied space launch engines to commercial launch services that also meet NSS needs. Award Other Transaction Authority (OTA) agreements to develop various industry solutions utilizing public-private partnerships. Continued the technical maturation and risk reduction activities started in FY 2014.</p> <p>FY 2019 Plans: Continue investments with public-private partnerships with domestic launch providers for the development of new launch systems or upgrades to existing launch systems with the goal of two or more domestic, commercial launch providers that also meet NSS requirements. Includes Rocket Propulsion System Investment and associated technical maturation and risk reduction activities. Continue program office support and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc.</p> <p>FY 2020 Plans: Continue investments with public-private partnerships with domestic launch providers for the development of new launch systems or upgrades to existing launch systems with the goal of two or more domestic, commercial launch providers that also meet NSS requirements. Includes Rocket Propulsion System Investment and associated technical maturation and risk reduction activities. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, prototyping, etc. LSA profile is based on the anticipated 4QTR 2019 award of Phase 2 that will result in the LSA efforts continuing with two service providers.</p> | | 261.877 | 243.035 | 394.509 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|--|--|
| Appropriation/Budget Activity 3600: Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD) | R-1 Program Element (Number/Name) PE 1206853F I National Security Space Launch Program (SPACE) - EMD |
|--|--|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|---------|---------|---------|
| Until the Phase 2 award the LSA funding cannot be broken out by provider due to the competitive nature of this acquisition strategy. | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 increased compared to FY 2019 by \$151.474M. Justification for this increase is described in the plans above. | | | |
| Accomplishments/Planned Programs Subtotals | 281.877 | 243.035 | 432.009 |

| | FY 2018 | FY 2019 |
|---|---------|---------|
| Congressional Add: Launch Service Agreement Congressional Add | 100.000 | 200.000 |
| FY 2018 Accomplishments: Invested with public-private partnerships with domestic launch providers for the development of new launch systems or upgrades to existing launch systems with the goal of two or more domestic, commercial launch providers that also meet NSS requirements. | | |
| FY 2019 Plans: Invest with public-private partnerships with domestic launch providers for the development of new launch systems or upgrades to existing launch systems with the goal of two or more domestic, commercial launch providers that also meet NSS requirements. | | |
| Congressional Adds Subtotals | 100.000 | 200.000 |

| D. Other Program Funding Summary (\$ in Millions) | | | | | | | | | | | |
|---|----------------|----------------|---------------------|--------------------|----------------------|----------------|----------------|----------------|----------------|-------------------------|-------------------|
| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020 Base</u> | <u>FY 2020 OCO</u> | <u>FY 2020 Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To Complete</u> | <u>Total Cost</u> |
| • SPAF 01 Line Item MSEELV: <i>Evolved Expendable Launch Veh (Space)</i> | 487.918 | 954.555 | 1,237.635 | - | 1,237.635 | 734.165 | 1,101.442 | 1,259.445 | 1,483.922 | 11,280.649 | 18,539.731 |
| • SPAF 01 Line Item MSEELC: <i>Evolved Expendable Launch Capability</i> | 904.948 | 659.981 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | - | 0.000 | 1,564.929 |

Remarks

E. Acquisition Strategy
 The Department intends to pursue a strategy to competitively invest in two or more domestic launch providers' development of new launch systems or upgrades to existing systems for future NSS launch services. This shared investment approach may also leverage commitments to a portion of the planned launch services (between FY 2020 and FY 2025) to decrease the required up front Government investment.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

Appropriation/Budget Activity
3600: *Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)*

R-1 Program Element (Number/Name)
PE 1206853F / *National Security Space Launch Program (SPACE) - EMD*

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|--|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206853F / <i>National Security Space Launch Program (SPACE) - EMD</i> | Project (Number/Name) 650006 / <i>Next Generation Launch System Investment</i> |
|--|---|--|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Aerojet Rocketdyne OTA | C/Various | Aerojet Rocketdyne : Canoga Park, CA | 277.001 | 20.000 | Jun 2018 | - | | 37.500 | Nov 2019 | - | | 37.500 | 5.136 | 339.637 | - |
| United Launch Service RPS OTA | C/Various | United Launch Service : Centennial, CO | 128.630 | - | | - | | - | | - | | - | 0.000 | 128.630 | - |
| United Launch Service LSA OTA | C/Various | United Launch Service : Centennial, CO | 0.000 | 109.635 | Oct 2018 | 149.970 | Dec 2018 | - | | - | | - | 0.000 | 259.605 | - |
| Orbital ATK OTA | C/Various | Orbital ATK : Magna, UT | 168.714 | - | | - | | - | | - | | - | 0.000 | 168.714 | - |
| Northrop Grumman OTA | C/Various | Northrop Grumman : Chandler, AZ | 0.000 | 109.635 | Oct 2018 | 157.938 | Dec 2018 | - | | - | | - | 0.000 | 267.573 | - |
| Space X OTA | C/Various | Space X : Hawthorne, CA | 97.844 | - | | - | | - | | - | | - | 0.000 | 97.844 | - |
| Blue Origin OTA | C/Various | Blue Origin : Kent, WA | 0.000 | 109.634 | Oct 2018 | 86.532 | Dec 2018 | - | | - | | - | 0.000 | 196.166 | - |
| Broad Agency Announcement Technical Maturation Studies | C/Various | Various : Various | 37.390 | - | | - | | - | | - | | - | 0.000 | 37.390 | - |
| NASA Advance Booster Engine Demonstration Risk Reduction (ABEDRR) | SS/ Various | Various : Various | 40.374 | - | | - | | - | | - | | - | 0.000 | 40.374 | - |
| Georgia Tech Combustion Stability Technical Maturation UARC | SS/ Various | Various : Various | 7.948 | - | | - | | - | | - | | - | 0.000 | 7.948 | - |
| NASA Combustion Stability Technical Maturation Study | SS/ Various | Various : Various | 6.800 | - | | - | | - | | - | | - | 0.000 | 6.800 | - |
| AFRL Combustion Stability Technical Maturation Study | SS/ Various | Various : Various | 3.179 | - | | - | | - | | - | | - | 0.000 | 3.179 | - |

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force **Date:** February 2019

| | | |
|--|---|--|
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206853F / <i>National Security Space Launch Program (SPACE) - EMD</i> | Project (Number/Name) 650006 / <i>Next Generation Launch System Investment</i> |
|--|---|--|

| Product Development (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| AFRL Hydrocarbon Boost Technical Maturation Demonstration | SS/ Various | Various : Various | 37.154 | - | | - | | - | | - | | - | 0.000 | 37.154 | - |
| FFRDC Mission Assurance | SS/CPAF | Aerospace : El Segundo, CA | 20.911 | 7.962 | Nov 2017 | 17.912 | Nov 2018 | 17.732 | Nov 2019 | - | | 17.732 | 24.763 | 89.280 | - |
| Launch Enterprise System Engineering and Integration | C/FP | Various : Various | 5.573 | 1.842 | Mar 2018 | 12.544 | Mar 2019 | 12.040 | Mar 2020 | - | | 12.040 | 8.660 | 40.659 | - |
| Launch Service Agreement (Including the Rocket Propulsion System) | C/TBD | TBD : TBD | 0.000 | - | | - | | 352.784 | Jan 2020 | - | | 352.784 | 1,079.010 | 1,431.794 | - |
| Subtotal | | | 831.518 | 358.708 | | 424.896 | | 420.056 | | - | | 420.056 | 1,117.569 | 3,152.747 | N/A |

| Support (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---------------------------------|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| Organic Civilian Support | Reqn | DOD : El Segundo, CA | 1.428 | 1.518 | Oct 2017 | 1.918 | Oct 2018 | 1.960 | Oct 2019 | - | | 1.960 | 8.446 | 15.270 | 15.628 |
| Subtotal | | | 1.428 | 1.518 | | 1.918 | | 1.960 | | - | | 1.960 | 8.446 | 15.270 | N/A |

| Management Services (\$ in Millions) | | | | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|------------------------|--------------------------------|-------------|---------|------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | | | |
| FFRDC | SS/CPAF | Aerospace : El Segundo, CA | 4.700 | 2.776 | Oct 2017 | 2.498 | Nov 2018 | 0.955 | Nov 2019 | - | | 0.955 | 4.053 | 14.982 | 5.263 |
| Advisory and Assistance Services | Various | Various : Various | 12.283 | 9.783 | Dec 2017 | 5.468 | Dec 2018 | 4.960 | Dec 2019 | - | | 4.960 | 13.664 | 46.158 | 15.258 |
| Other Support | Various | Various : Various | 15.950 | 9.092 | Nov 2017 | 8.255 | Nov 2018 | 4.078 | Nov 2019 | - | | 4.078 | 13.545 | 50.920 | 1.254 |
| Subtotal | | | 32.933 | 21.651 | | 16.221 | | 9.993 | | - | | 9.993 | 31.262 | 112.060 | N/A |

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|--|--------------------|----------------|---|----------------|--|---------------------|--|----------------------|-------------------------|-------------------|---------------------------------|
| Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force | | | | | | | Date: February 2019 | | | | |
| Appropriation/Budget Activity 3600 / 5 | | | R-1 Program Element (Number/Name) PE 1206853F / <i>National Security Space Launch Program (SPACE) - EMD</i> | | | | Project (Number/Name) 650006 / <i>Next Generation Launch System Investment</i> | | | | |
| | Prior Years | FY 2018 | | FY 2019 | | FY 2020 Base | FY 2020 OCO | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
| Project Cost Totals | 865.879 | 381.877 | | 443.035 | | 432.009 | - | 432.009 | 1,157.277 | 3,280.077 | N/A |

Remarks

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| | | | | | | | |
|---|--|---|----------------------------|--|--|--|--|
| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force | | | Date: February 2019 | | | | |
| Appropriation/Budget Activity 3600 / 5 | | R-1 Program Element (Number/Name) PE 1206853F / <i>National Security Space Launch Program (SPACE) - EMD</i> | | | Project (Number/Name) 650006 / <i>Next Generation Launch System Investment</i> | | |

| | FY 2018 | | | | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | | | | | |
|--|------------|---|---|---|------------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|---------|---|---|---|--|--|--|--|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | | | | |
| <i>Rocket Propulsion System (RPS) Development</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Aerojet Rocketdyne OTA | [REDACTED] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Launch Service Agreement (LSA)</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Blue Origin OTA | | | | | [REDACTED] | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Northrop Grumman OTA | | | | | [REDACTED] | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| United Launch Services OTA | | | | | [REDACTED] | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 5 | R-1 Program Element (Number/Name) PE 1206853F / <i>National Security Space Launch Program (SPACE) - EMD</i> | Project (Number/Name) 650006 / <i>Next Generation Launch System Investment</i> |

Schedule Details

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| <i>Rocket Propulsion System (RPS) Development</i> | | | | |
| Aerojet Rocketdyne OTA | 1 | 2018 | 4 | 2020 |
| <i>Launch Service Agreement (LSA)</i> | | | | |
| Blue Origin OTA | 1 | 2019 | 4 | 2024 |
| Northrop Grumman OTA | 1 | 2019 | 4 | 2024 |
| United Launch Services OTA | 1 | 2019 | 4 | 2024 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0604256F / <i>Threat Simulator Development</i> |
|---|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 34.777 | 34.206 | 59.693 | 0.000 | 59.693 | 63.925 | 44.844 | 36.577 | 31.717 | Continuing | Continuing |
| 662907: <i>Electronic Combat Intel Support</i> | - | 2.474 | 2.556 | 2.603 | 0.000 | 2.603 | 2.648 | 2.704 | 2.753 | 2.802 | Continuing | Continuing |
| 663321: <i>Electronic Warfare Ground Test Resources</i> | - | 25.261 | 24.409 | 49.714 | 0.000 | 49.714 | 53.774 | 34.481 | 26.027 | 20.977 | Continuing | Continuing |
| 667500: <i>Foreign Materiel Acquisition/Analysis</i> | - | 7.042 | 7.241 | 7.376 | 0.000 | 7.376 | 7.503 | 7.659 | 7.797 | 7.938 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

The AF requires a comprehensive set of indoor and outdoor test facilities to implement the Air Force Electronic Warfare (EW) Test Process in order to test EW systems, including Directed Energy (DE). To manage program risk effectively throughout the EW weapons system acquisition process, and to conduct T&E effectively and efficiently, a broad multi-spectrum integrated set of T&E capabilities, ranging from Modeling and Simulation (M&S), to full-scale chamber testing, to flight testing on open-air ranges (OAR), is required. The EW Test Process Support task provides investment management and coordinated technical oversight of EW T&E facilities, including studies, analyses, and related documentation. Additionally, successful EW capabilities in battle are predicated upon a thorough understanding of the threat. To meet that requirement, this PE also includes funding to acquire foreign materiel, and to thoroughly test and evaluate that foreign materiel to understand how those threat systems affect and are affected by our EW systems.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 6, RDT&E Management Support because this budget activity includes research, development, test and evaluation efforts and funds to sustain and/or modernize the installations or operations required for general research, development, test and evaluation.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0604256F / <i>Threat Simulator Development</i> |
|---|---|

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 35.405 | 34.256 | 46.393 | 0.000 | 46.393 |
| Current President's Budget | 34.777 | 34.206 | 59.693 | 0.000 | 59.693 |
| Total Adjustments | -0.628 | -0.050 | 13.300 | 0.000 | 13.300 |
| • Congressional General Reductions | -0.031 | -0.050 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -0.597 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 13.300 | 0.000 | 13.300 |

Change Summary Explanation

FY20: AF increased funding by \$13.3M to support the National Radar Cross Section Test Facility Dynamic Radar Cross Section Range (NRTF Dynamic RCS) improvement and modernization effort.

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|---|--------------------|----------------|----------------|---------------------|---|----------------------|----------------|----------------|---|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 6 | | | | | R-1 Program Element (Number/Name) PE 0604256F / <i>Threat Simulator Development</i> | | | | Project (Number/Name) 662907 / <i>Electronic Combat Intel Support</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 662907: <i>Electronic Combat Intel Support</i> | - | 2.474 | 2.556 | 2.603 | 0.000 | 2.603 | 2.648 | 2.704 | 2.753 | 2.802 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

This project provides funding to support Foreign Materiel Operational Test and Evaluation (FMOT&E), which ensures the ability of operational commands to test and develop effective Electronic Attack/Electronic Protection (EA/EP) techniques and tactics. Funds are required for: deployment of systems to test facilities; travel of personnel to the test sites to evaluate and validate test results; range and laboratory costs; test consumables; costs for instrumentation of systems; and contracted engineering support for the conduct of tests and subsequent reporting. Funding for this program is required to prevent future aircraft losses due to improper and inaccurate aircrew tactics (e.g., lack of evasive action or proper tactics training to avoid missile attack).

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| Title: FMOT&E | 2.474 | 2.556 | 2.603 |
| Description: Supports Foreign Materiel Operational Test and Evaluation (FMOT&E) | | | |
| FY 2019 Plans: Continue operations of electronic combat intelligence support for fighter and bomber testing, mobility special operations transport and helicopter testing, classified operational assessments and extensive evaluations and reporting of system effectiveness. | | | |
| FY 2020 Plans: Continue operations of electronic combat intelligence support for fighter and bomber testing, mobility special operations transport and helicopter testing, classified operational assessments and extensive evaluations and reporting of system effectiveness. | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: Not applicable. | | | |
| Accomplishments/Planned Programs Subtotals | 2.474 | 2.556 | 2.603 |

C. Other Program Funding Summary (\$ in Millions)

| Line Item | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|----------------|----------------|---------------------|--------------------|----------------------|----------------|----------------|----------------|----------------|-------------------------|-------------------|
| • RDTE 06 PE 0604759F: <i>Major T&E Investment</i> | 111.138 | 216.844 | 181.663 | - | 181.663 | 164.005 | 142.090 | 81.386 | 81.843 | Continuing | Continuing |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 6 | R-1 Program Element (Number/Name) PE 0604256F / <i>Threat Simulator Development</i> | Project (Number/Name) 662907 / <i>Electronic Combat Intel Support</i> |

C. Other Program Funding Summary (\$ in Millions)

| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> | <u>FY 2020</u> | <u>FY 2020</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To</u> | |
|---|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-----------------|-------------------|
| | | | <u>Base</u> | <u>OCO</u> | <u>Total</u> | | | | | <u>Complete</u> | <u>Total Cost</u> |
| • RDTE 06 PE 0605807F: <i>Test and Evaluation Support</i> | 735.688 | 692.784 | 717.895 | - | 717.895 | 721.615 | 761.252 | 765.736 | 779.877 | Continuing | Continuing |
| • RDTE 06 PE 0605976F: <i>Facility Restoration and Modernization - T&E</i> | 135.507 | 187.216 | 88.445 | - | 88.445 | 69.293 | 70.730 | 72.019 | 73.315 | Continuing | Continuing |
| • RDTE 06 PE 0605978F: <i>Facility Sustainment - T&E Support</i> | 28.720 | 28.888 | 29.424 | - | 29.424 | 29.935 | 30.555 | 31.112 | 31.673 | Continuing | Continuing |

Remarks

D. Acquisition Strategy

Not applicable.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 6 | | | | | R-1 Program Element (Number/Name) PE 0604256F / <i>Threat Simulator Development</i> | | | | Project (Number/Name) 663321 / <i>Electronic Warfare Ground Test Resources</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 663321: <i>Electronic Warfare Ground Test Resources</i> | - | 25.261 | 24.409 | 49.714 | 0.000 | 49.714 | 53.774 | 34.481 | 26.027 | 20.977 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

This project provides funding to improve and modernize threat system simulators, stimulators, emitters and supporting infrastructure used to sufficiently and cost-effectively test and evaluate current and new weapon systems in threat-representative environments. The National Radar Cross Section (RCS) Test Facility (NRTF) at Holloman AFB, NM, provides timely, accurate, and secure RCS and antenna measurements for tri-service and joint program offices, DoD laboratories, Defense Advanced Research Projects Agency (DARPA) and industry. The NRTF tests fielded and developmental systems and technologies to meet Low Observable (LO) and EW customer requirements. The Guided Weapons Evaluation Facility (GWEF) at Eglin AFB, FL, and the Digital Integrated Air Defense System (DIADS) at Edwards AFB, CA, provide the ability to realistically evaluate hardware and software components of US weapon systems against manned hardware threat representations throughout the acquisition process. The GWEF provides simulations of advanced Infrared (IR) Surface-to-Air Missiles (SAMs) and Air-to-Air Missiles (AAMs), IR and Laser countermeasure functions, and the integration of actual threat hardware and ground clutter into advanced threat IR missile simulations. DIADS provides both algorithm-based and man-in-the-loop-based enemy command and control (C2) capabilities that integrate early warning radar detection, SAM engagement capabilities, and limited ground-controlled fighter intercept features in a comprehensive M&S environment. The Benefield Anechoic Facility (BAF) at Edwards AFB, CA, and the Joint Preflight Integration of Munitions and Electronic Systems (J-PRIMES) facility at Eglin AFB, FL, both provide threat-representative EW emitters and stimulators to replicate a variety of land, sea and airborne threats in a controlled RF environment to evaluate full-scale weapon systems. The BAF additionally provides an ability to perform Electromagnetic Interference/Compatibility (EMI/EMC) testing to ensure radars, jammers, radios, and other flight-critical electronic systems will not interfere with each other during a mission. The Central Inertial and GPS Test Facility (CIGTF) at the 704th Test Group at Holloman AFB, NM provides threat-representative GPS jammers and laydowns in both lab and open-air environments to test avionics systems' performance when under various GPS-denial conditions.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| Title: I&M | 16.046 | 22.713 | 29.590 |
| Description: Provides for planning and improvement & modernization (I&M) of test capabilities to conduct and support the AF EW test process, including DE. Plans for FY2019 and FY2020 include, but are not limited to, the following improvement and modernization efforts which may be accelerated or delayed due to variations in customer requirements and overall project execution. | | | |
| FY 2019 Plans: Red Integrated Air Defense System (Red-IADS), Electronics Warfare Test Capability Improvement Program (EWTCIP), Jammer Electronic Counter Measures Enhancement and Integration, National RCS Test Facility (NRTF) Modernization and Measurement | | | |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 6 | R-1 Program Element (Number/Name) PE 0604256F / <i>Threat Simulator Development</i> | Project (Number/Name) 663321 / <i>Electronic Warfare Ground Test Resources</i> | | |
| B. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| <p>programs begin in FY19. IR EW Threat Simulators (IREWTS), NEWEG for J-PRIMES (NEWEG-J) and CIGTF GPS NAVWAR Upgrade (CGNU) programs continue executing development, procurement and integration as appropriate.</p> <p>FY 2020 Plans: Continue Red Integrated Air Defense System (Red-IADS), Electronics Warfare Test Capability Improvement Program (EWTCIP), Jammer Electronic Counter Measures Enhancement and Integration, National RCS Test Facility (NRTF) Modernization and Measurement programs which began in FY19. NEWEG for J-PRIMES (NEWEG-J) and CIGTF GPS NAVWAR Upgrade (CGNU) programs continue executing development, procurement and integration as appropriate.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: \$6.877 million overall increase due to \$13.3 million funding increase of the National Dynamic Radar Cross Section Range improvement and modernization effort and a \$6.423 million decrease due to conclusion of Advanced Warfare T&E Capability (AWTEC) and IREWTS projects; and a decrease in on-going project funding such as Red IADS and NEWEG for J-PRIMES.</p> | | | | |
| <p>Title: EC Test Process Support</p> <p>Description: Electronic Combat (EC) Test Process Support. Conduct requirements analyses and other studies in support of Air Force T&E investments in test infrastructure and capabilities.</p> <p>FY 2019 Plans: Continue to provide SETA support needed to implement planned Air Force test processes and infrastructure I&M capabilities. Team members will continue to support tri-service monitoring and analysis teams established to identify emerging joint investment needs and requirements development. Team members will help manage and monitor I&M program elements and activities.</p> <p>FY 2020 Plans: Continue to provide SETA support needed to implement planned Air Force test processes and infrastructure I&M capabilities. Team members will continue to support tri-service monitoring and analysis teams established to identify emerging joint investment needs and requirements development. Team members will help manage and monitor I&M program elements and activities.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: \$18.428 million increase due to ramp up of the Fifth Generation Aerial Target Evaluation (5GATE) effort.</p> | | 9.215 | 1.696 | 20.124 |
| Accomplishments/Planned Programs Subtotals | | 25.261 | 24.409 | 49.714 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 6 | R-1 Program Element (Number/Name) PE 0604256F / <i>Threat Simulator Development</i> | Project (Number/Name) 663321 / <i>Electronic Warfare Ground Test Resources</i> |

C. Other Program Funding Summary (\$ in Millions)

| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> | <u>FY 2020</u> | <u>FY 2020</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To</u> | |
|---|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-----------------|-------------------|
| | | | <u>Base</u> | <u>OCO</u> | <u>Total</u> | | | | | <u>Complete</u> | <u>Total Cost</u> |
| • RDTE 06 PE 0604759F: <i>Major T&E Investment</i> | 111.138 | 216.844 | 181.663 | - | 181.663 | 164.005 | 142.090 | 81.386 | 81.843 | Continuing | Continuing |
| • RDTE 06 PE 0605807F: <i>Test and Evaluation Support</i> | 735.688 | 692.784 | 717.895 | - | 717.895 | 721.615 | 761.252 | 765.736 | 779.877 | Continuing | Continuing |
| • RDTE 06 PE 0605976: <i>Facility Restoration & Modernization - T&E</i> | 135.507 | 187.216 | 88.445 | - | 88.445 | 69.293 | 70.730 | 72.019 | 73.315 | Continuing | Continuing |
| • RDTE 06 PE 0605978F: <i>Facilities Sustainment - T&E Support</i> | 28.720 | 28.888 | 29.424 | - | 29.424 | 29.935 | 30.555 | 31.112 | 31.673 | Continuing | Continuing |

Remarks

D. Acquisition Strategy

NA

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 6 | | | | | R-1 Program Element (Number/Name) PE 0604256F / <i>Threat Simulator Development</i> | | | | Project (Number/Name) 667500 / <i>Foreign Materiel Acquisition/ Analysis</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 667500: <i>Foreign Materiel Acquisition/Analysis</i> | - | 7.042 | 7.241 | 7.376 | 0.000 | 7.376 | 7.503 | 7.659 | 7.797 | 7.938 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

This project's specific purpose is to support USAF Foreign Materiel Program requirements through the acquisition and analysis of foreign materiel. Items considered for these Foreign Materiel Acquisition (FMA) funds are included in the prioritized Air Force FMA Top 20 list established each year. Each Major Command (MAJCOM) prepares and approves a Foreign Materiel - Mission Requirements Statement for each requirement. Annually, the MAJCOM commanders establish a list of their top 20 requirements. The MAJCOMs' requirements lists are integrated and prioritized into a classified Air Force requirement list. Each MAJCOM then approves the FMA Top 20 List and final validation comes from the Air Force Vice Chief of Staff. System analyses are based on and driven by acquisitions. The USAF provides assessments and data for threat systems to all DoD components.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| Title: FMP | 7.042 | 7.241 | 7.376 |
| Description: Supports USAF Foreign Materiel Program (FMP) Requirements through the acquisition and analysis of foreign materiel. | | | |
| FY 2019 Plans: Continue to fund acquisition of available Foreign Materiel in accordance with the prioritized Air Force Foreign Materiel List; analysis of acquired Foreign Materiel; and operations and maintenance of the specialized Foreign Materiel assets. | | | |
| FY 2020 Plans: Continue to fund acquisition of available Foreign Materiel in accordance with the prioritized Air Force Foreign Materiel List; analysis of acquired Foreign Materiel; and operations and maintenance of the specialized Foreign Materiel assets. | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: Not applicable. | | | |
| Accomplishments/Planned Programs Subtotals | 7.042 | 7.241 | 7.376 |

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 6 | R-1 Program Element (Number/Name) PE 0604256F / <i>Threat Simulator Development</i> | Project (Number/Name) 667500 / <i>Foreign Materiel Acquisition/ Analysis</i> |
|--|---|--|

C. Other Program Funding Summary (\$ in Millions)

| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> <u>Base</u> | <u>FY 2020</u> <u>OCO</u> | <u>FY 2020</u> <u>Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To</u> <u>Complete</u> | <u>Total Cost</u> |
|--|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|
| • RDTE 06 PE 0604759F: <i>Major T&E Investment</i> | 111.138 | 216.844 | 181.663 | - | 181.663 | 164.005 | 142.090 | 81.386 | 81.843 | Continuing | Continuing |
| • RDTE 06 PE 0605807F: <i>Test and Evaluation Support</i> | 735.688 | 692.784 | 717.895 | - | 717.895 | 721.615 | 761.252 | 765.736 | 779.877 | Continuing | Continuing |
| • RDTE 06 PE 0605976F: <i>Facility Restoration & Modernization - T&E</i> | 135.507 | 187.216 | 88.445 | - | 88.445 | 69.293 | 70.730 | 72.019 | 73.315 | Continuing | Continuing |
| • RDTE 06 PE 0605978F: <i>Facilities Sustainment -T&E Support</i> | 28.720 | 28.888 | 29.424 | - | 29.424 | 29.935 | 30.555 | 31.112 | 31.673 | Continuing | Continuing |

Remarks

D. Acquisition Strategy

Not applicable.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0604759F / <i>Major T&E Investment</i> |
|---|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 111.138 | 216.844 | 181.663 | 0.000 | 181.663 | 164.005 | 142.090 | 81.386 | 81.843 | Continuing | Continuing |
| 664597: <i>Air Force Test Investments</i> | - | 111.138 | 216.844 | 181.663 | 0.000 | 181.663 | 164.005 | 142.090 | 81.386 | 81.843 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

This PE provides planning, improvements, and modernization for test capabilities within Air Force Test Center (AFTC) Major Range and Test Facility Base organizations: 96 Test Wing at Eglin AFB FL, the 412 Test Wing at Edwards AFB CA, and Arnold Engineering Development Complex (AEDC) at Arnold AFB TN. The 704th Test Group at Holloman AFB NM and the McKinley Climatic Lab at Eglin AFB are now aligned under AEDC as part of the management consolidation of Ground test capabilities. The purpose is to improve and develop infrastructure and capabilities to deliver relevant and cost-effective test and evaluation capabilities suitable for current and planned weapon systems.

The improvement and modernization (I&M) requirements are defined through the AF Test Investment Planning & Programming (TIPP) Process. All projects have been reviewed through the Tri-Service Reliance process (to communicate AF efforts to the other Services and avoid unwarranted duplication of effort) and are documented in the Technology Development Acquisition Program (TDAP) database. Each project has its own planning, development, equipment acquisition, equipment installation, and checkout phases which often require significant differences in funding from one year to the next. As such, the changes in category funding from year to year does not necessarily indicate program growth, but rather a planned phasing of improvement and modernization efforts. The test capabilities at these locations enable testing through all phases of weapon system acquisition, from system concept exploration through component and full-scale integrated weapon system test to operational test.

These test organizations are a part of the Major Range and Test Facility Base (MRTFB), operated and maintained by the Air Force for DoD Test and Evaluation (T&E). These national test assets are available to others requiring their unique capabilities.

The 96 TW, at Eglin AFB FL, conducts and supports developmental test and evaluation (DT&E) of non-nuclear air armaments; Command, Control, Communications, Computers, Intelligence, Surveillance, Reconnaissance (C4ISR) systems; target acquisition and weapon delivery systems; determines target/test item spectral signatures; and provides Cyber testing capabilities as part of the Avionics Cyber Range (ACR).

The 412th Test Wing, at Edwards AFB CA, conducts and supports DT&E and Operational Test and Evaluation (OT&E) of aircraft and aircraft systems, aerospace research vehicles, unmanned aerial vehicles, cruise missiles, parachute delivery/recovery/systems, and cargo handling systems.

AEDC, at Arnold AFB TN, provides pre-flight reliability environmental test support for DoD aeropropulsion, flight systems, and space and missile programs. The center has 53 test facilities providing: aerodynamic testing of scale model aircraft, missiles, and space systems; testing of large and full-scale satellites, sensors, and space vehicles in a simulated space environment; altitude environmental testing for aircraft, missile, and spacecraft propulsion systems; testing of large-scale models such as

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force</i> / BA 6: <i>RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0604759F / <i>Major T&E Investment</i> | |
| <p>space boosters together with their propulsion systems. This capability includes the worlds largest climatic laboratory - the McKinley Climatic Laboratory at Eglin AFB which provides controlled all-weather condition testing of full scale systems. The 704 TG at Holloman AFB, NM provides flight test and test support for joint, international and commercial customers in advanced avionics and weapons, inertial navigation systems, Global Positioning System (GPS) and other integrated aircraft and missile navigation systems. They test subsonic through hypersonic ground performance of aircraft and missiles in a flight-representative, highly instrumented environment while also coordinating and scheduling all US Air Force test operations at White Sands Missile Range. The 704 TG, OL-AC at Wright-Patterson AFB, OH provides independent developmental T&E in support of aircraft survivability and evaluation of full-scale aircraft landing gear, tires and brakes, including. In addition, they provide an independent capability for component qualification.</p> <p>In previous PB documentation, I&M efforts within this PE were identified via four mission area categories: Airframe/Propulsion/Avionics (APA); Armament/Munitions (A/M); Command, Control, Communications, Computers, Intelligence, Surveillance, Reconnaissance (C41SR)/Cyber; and Space. However, in order to align the strategic capability goals set forth in the 2018 National Defense Strategy and the mission of the AFTC, several of the aforementioned areas have been discontinued and the funding realigned to new mission area categories. As of the FY20 PB, the six mission areas are:</p> <ol style="list-style-type: none"> 1) T&E Range and Test Asset Modernization refers to those capabilities required to acquire the ability to test long range, high-speed, highly-instrumented, high-data rate weapons in a crowded and restricted spectrum, while operating at multiple classification and cybersecurity levels. Ability to collect, analyze and store big data and ability to do multi-domain testing across the enterprise with realistic threat scenarios at multiple classification level up to Special Access Program (SAP). 2) Hypersonics refers to the ability to T&E flight-representative hypersonic engines, materials, warheads and fuzes in all portions of the employment envelope and conduct flight testing both in simulation and open-air ranges with sufficient space, telemetry, photo-optics and Time Space Position Information (TSPI) to appropriately inform decision-makers fielding such systems. 3) Directed Energy/Electronic Combat acquires the ability to characterize irradiance and beam properties on aircraft, small UAVs and ground targets and create realistic environments to simulate adversary air defense capabilities in the year 2030. Enables 5-6th generation weapon testing/tactics development in a threat-realistic Anti-Access Area Denial (A2AD) environment using a combination of indoor and open-air ranges. 4) Cyberspace and Avionics Cyber is the advancement of cybersecurity/resiliency test capability for network, C41SR and airborne weapon platforms and includes development of tools, techniques and hardware in the loop capabilities focused on cybersecurity and cyber-resiliency. 5) Autonomy refers to the ability to test autonomous aerial and ground systems with hundreds of independent vehicles. Must be able to monitor system-under-test locations and states with the ability for soft and hard termination. Must develop techniques and processes to test systems with artificial intelligence. 6) Space Test Infrastructure refers to the development of a Space Combined Test Force and the development of technical capabilities, both terrestrial and space-based assets, in order to deploy an initial level of ability to test and evaluate the capability and resilience of DoD Space systems in a contested environment. | | |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0604759F / <i>Major T&E Investment</i> |
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As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 6, RDT&E Management Support because this budget activity includes research, development, test and evaluation efforts and funds to sustain and/or modernize the installations or operations required for general research, development, test and evaluation.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 82.874 | 91.844 | 181.663 | 0.000 | 181.663 |
| Current President's Budget | 111.138 | 216.844 | 181.663 | 0.000 | 181.663 |
| Total Adjustments | 28.264 | 125.000 | 0.000 | 0.000 | 0.000 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 30.000 | 125.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -1.736 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Change Summary Explanation

FY18: AF received \$30 million in Congressional add funding of which \$25 million modernizes equipment as part of the Gulf Range Enhancement (GRE) effort and \$5 million is for weapon system cyber resiliency.

FY19: AF received \$125 million in Congressional add funding of which \$54 million was set aside for Space Test infrastructure development, \$5 million was set aside for UAV-based EW test platform capability, \$5 million was allocated to the Avionics Cyber Range to procure additional test benches and software tools, \$10 million was allocated to instrumentation test capabilities at both Edwards and Eglin AFBs, \$25 million was assigned to procurement of a heater system at AEDC to improve hypersonic testing of thermal protection systems, and \$26 million was allocated to procure marine fiber optics deployment to the SE portion of the Gulf of Mexico to accelerate GRE capabilities.

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| Title: T&E Range and Test Asset Modernization | 96.032 | 107.213 | 37.538 |
| Description: T&E Range and Test Asset Modernization refers to those capabilities required to acquire the ability to test long range, high-speed, highly-instrumented, high-data rate weapons in a crowded and restricted spectrum, while operating at multiple | | | |

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|--|---|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|---------|---------|---------|
| <p>classification and cybersecurity levels. Ability to collect, analyze and store big data and ability to do multi-domain testing across the enterprise with realistic threat scenarios at multiple classification level up to Special Access Program (SAP).</p> <p>FY 2019 Plans: Plans for FY2019 include, but are not limited to, the following improvement and modernization efforts which may be accelerated or delayed due to variations in customer requirements and overall project execution.</p> <p>Improve Transonic Test Capability (IMTTC) will continue to install and integrate hardware and software enhancements for TCC and 16T Test Article Control System (TACS).</p> <p>Voice Communication System Upgrade (VCSU) Program will continue to migrate voice systems for multiple mission control rooms.</p> <p>CRIIS Production will complete Lot 2 and start Lot 3 procurement of OSD CTEIP developed CRIIS TSPI increment two pods, aircraft internal mounts and ground support infrastructure.</p> <p>Network Telemetry Integration Program (NTIP) will initialize and procure the first aircraft to be migrated to the iNET System.</p> <p>Common Airborne Network Instrumentation System (CANIS) will continue supporting and complementing the CTEIP funded iNET Program by implementing the airborne solutions. FY19 activity will include completing the implementation of spirals 0, 1, and 2 of the CANIS acquisition approach.</p> <p>Next Generation Turbine Engine Test Capability (NGTETC) will continue upgrades to exhaust coolers, compressor inbleed, power and thermal management systems.</p> <p>Improve Plant Reliability & Efficiency/Transonic Aero Test Capability (IMTPC) will continue to restore the capabilities of the main drive motors (rewind main drive motors M1 and M4), C1 compressor (replace both C1 compressor rotor blades and spacers), main drive motor sub-systems (refurbish/replace), C1 compressor subsystems (refurbish/replace), and the electrical support systems (refurbish/replace primary Propulsion Wind Tunnel (PWT) facility main drive electrical utilities) to original specifications.</p> <p>Modular Mission Control Room Upgrade (MMCRU) will continue software development and roll out and integration of control room displays across multiple control rooms.</p> | | | |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0604759F / <i>Major T&E Investment</i> |
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| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|

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| <p>Advanced Small Military High Speed Engine Capability (AMSC) will begin Phase II procurement and integration to accommodate future test efforts.</p> <p>Gulf Range Enhancement (GRE) begins measured implementation to extend Time Space Position Information (TSPI) capabilities south into the Gulf Range for expanded use of the airspace for increased throughput of flight test efforts as well as to support future hypersonic, swarming autonomous vehicles, and Long-Range Standoff (LRSO) test efforts. Fiber optic network design and deployment in the SE Gulf of Mexico accelerates IOC of 500 nautical mile range test capability along the west coast of Florida at Eglin AFB.</p> <p>Improved C2 Test Operations Center (I-C2TOC) will continue development of secure network infrastructure and initiate procurement of software and hardware servers and workstations needed to enhance net-centric C2 battle management operations and test control capabilities, improve communication interfaces and data collection, handling, analysis and display capabilities supporting C4ISR end-to-end weapon system testing at Eglin AFB.</p> <p>Improved Data Links (IDL) will begin studies and pre-acquisition work for test solutions for Fourth Gen aircraft systems.</p> <p>FY 2020 Plans: Continue planning and/or execution of the following programs: CRIIS Production, Network Telemetry Integration Program (NTIP) (formerly iSIS), Common Airborne Network Instrumentation System (CANIS), Modular Mission Control Room Upgrade (MMCRU), Voice Communication System Upgrade (VCSU), Joint Airborne Instrumentation Integration (JAII), Common Airborne Network Instrumentation System (CANIS), Combined High-Speed/High-Resolution EO/IR Imaging (CHSHR), Improved C2 Test Operations Center (I - C2TOC), Airborne Sensor Data Correlation Project (ASDC), Improved Data Link HITLS - Gen 4 & 5, Multi-Level Security - Joint Collaborative Environment (MLS - JCE), Advanced Large Military Engine Capability (ALMEC), Improve Transonic Test Capability (IMTTC), Test Instrumentation, Data Systems & Control (TIDSC), Next Generation Turbine Engine Test Capability (NGTETC), Improve Plant Reliability and Efficiency/Transonic Aero Test Capability (IMTPC), Improve Large Model Supersonic Aerodynamic Ground T&E Capability (ILMSC) [formerly Tunnel 16S Reactivation], Full-scale Subsonic Wind Tunnel - Fan Blades (NFAC-Blades), Advanced Engine Requirements for Power and Thermal Loads, High-speed Small Engine Test Capability (HSETC) (previously ASMEC-II), and the Gulf Range Enhancement (GRE) project.</p> <p>Pre-Milestone A Studies and Proof of Concepts will be implemented as required to improve future I&M acquisition efforts.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p> | | | |
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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | | R-1 Program Element (Number/Name) PE 0604759F / <i>Major T&E Investment</i> | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| Decrease of \$69.475 million due to \$36 million of FY19 add funding (for GRE and instrumentation) not carried forward to FY20, a \$36 million decrease for such projects as NGTETC, VCSU, IMTPC, CANIS, ASMEC Phase III, IMTTC, and I-C2TOC as they move towards completion, and a \$2.5 million increase for ISIS and MMCRU projects. | | | | |
| <p>Title: Hypersonics</p> <p>Description: Hypersonics refers to the ability to T&E flight-representative hypersonic engines, materials, warheads and fuzes in all portions of the employment envelope and conduct flight testing both in simulation and open-air ranges with sufficient space, telemetry, photo-optics and Time Space Position Information (TSPI) to appropriately inform decision-makers fielding such systems.</p> <p>FY 2019 Plans: Plans for FY2019 include, but are not limited to, the following improvement and modernization efforts which may be accelerated or delayed due to variations in customer requirements and overall project execution.</p> <p>The Mid-Pressure Arc Heater (MPAH) power supply project at AEDC will procure and install an improved heater to enable the arc heater to simulate larger hypersonic thermal protection system samples.</p> <p>The Imaging Improvement and Modernization Project (I2MP) at 704 TG will develop and procure advanced imaging cameras and tracking systems to improve photo optical data quality for hypersonic rocket sled testing.</p> <p>Next Generation Munitions Test Environment (NGMTE) will complete upgrades to aging gun and munitions test infrastructure, development and procurement of common data instrumentation and acquisition systems, and replacement of environmental test chambers/facilities supporting gun and arena test capabilities.</p> <p>FY 2020 Plans: Other Hypersonic upgrades to the AEDC range facility are being addressed by the OSD HYTIP program.</p> <p>Pre-Milestone A Studies and Proof of Concepts will be implemented as required to improve future I&M acquisition efforts.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Decrease of \$25.4 million largely attributable to \$25 million in FY19 add funding not applying to FY20, used for the mid pressure arc heater increment 2 effort.</p> | | 3.030 | 25.400 | 0.200 |
| Title: Directed Energy/Electronic Combat | | 0.000 | 3.850 | 109.580 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
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| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| <p>Description: Directed Energy/Electronic Combat acquires the ability to characterize irradiance and beam properties on aircraft, small UAVs and ground targets and create realistic environments to simulate adversary air defense capabilities in the year 2030. Enables 5-6th generation weapon testing/tactics development in a threat-realistic Anti-Access Area Denial (A2AD) environment using a combination of indoor and open-air ranges.</p> <p>FY 2019 Plans: Plans for FY2019 include, but are not limited to, the following improvement and modernization efforts which may be accelerated or delayed due to variations in customer requirements and overall project execution.</p> <p>The Joint Simulation Environment (JSE) program will begin planning and study efforts to create a USAF high fidelity simulation capability accreditable for test as a supplement to open air environments. As part of the expanded FY17 Defense Laboratory Modernization Pilot Program, two MILCON facilities will be built for developmental and operational test use. Planning and design for JSE (Edwards) and JSE (Nellis) will begin in FY19, with construction to begin in FY20.</p> <p>FY 2020 Plans: Construction of the two JSE facilities at Edwards and Nellis begins.</p> <p>The Advanced Multispectral Development (AMD) program will continue execution.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Increase of \$105.730 million due largely to JSE construction and stand-up. Stand-up includes \$36 million for long lead specialized items to construct the simulator domes and associated manpower support.</p> | | | | |
| <p>Title: Cyberspace and Avionics Cyber</p> <p>Description: Cyberspace and Avionics Cyber is the advancement of cybersecurity/resiliency test capability for network, C41SR and airborne weapon platforms and includes development of tools, techniques and hardware in the loop capabilities focused on cybersecurity and cyber-resiliency.</p> <p>FY 2019 Plans: Plans for FY2019 include, but are not limited to, the following improvement and modernization efforts which may be accelerated or delayed due to variations in customer requirements and overall project execution.</p> <p>Cyber Defense Test Capability (CDTC) will continue in FY19. During this phase the plan for acquiring and training the workforce necessary for cybersecurity test and evaluation will continue.</p> | | 12.076 | 21.381 | 33.145 |

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| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| <p>The planning and design phase for the new cyberspace test facility for the 96th Test Wing Cyber Test Group at Eglin begins. The Cyberspace MILCON is the third AFTC project to leverage the FY17 expanded Defense Laboratory Modernization Pilot Program.</p> <p>FY 2020 Plans: Continue planning and execution of the Weapon System Cybersecurity (WSCS) Program.</p> <p>Cyberspace Test facility construction begins.</p> <p>Pre-Milestone A Studies and Proof of Concepts will be implemented as required to improve future I&M acquisition efforts.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Increase of \$11.764 million associated with the transition from planning and design in FY19 to construction in FY20 of the Cyberspace facility at Eglin.</p> | | | | |
| <p>Title: Autonomy</p> <p>Description: Autonomy refers to the ability to test autonomous aerial and ground systems with hundreds of independent vehicles. Must be able to monitor system-under-test locations and states with the ability for soft and hard termination. Must develop techniques and processes to test systems with artificial intelligence.</p> <p>FY 2019 Plans: \$5M added to the Major T&E Investment line for UAV electronic warfare capabilities is unexecutable as the AF does not have an existing test requirement.</p> <p>FY 2020 Plans: Pre-Milestone A Studies and Proof of Concepts will be implemented as required to improve future I&M in the area of autonomous vehicle test.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: The decrease in funding between FY19 and FY20 is due to the one-time UAV electronic warfare capabilities FY19 Congressional add.</p> | | 0.000 | 5.000 | 0.200 |
| <p>Title: Space</p> <p>Description: Space Test Infrastructure refers to the development of a Space Combined Test Force and the development of technical capabilities, both terrestrial and space-based assets, in order to deploy an initial level of ability to test and evaluate the capability and resilience of DoD Space systems in a contested environment.</p> <p>FY 2019 Plans:</p> | | 0.000 | 54.000 | 1.000 |

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0604759F / <i>Major T&E Investment</i> |
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| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|---------|---------|---------|
| Build up of foundational infrastructure elements including such things as test facilities, network infrastructure, electronic warfare test equipment, and physics-based modeling and simulation. | | | |
| <i>FY 2020 Plans:</i> Continue FY19 efforts. | | | |
| <i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> The decrease in funding between FY19 and FY20 is a result of the one time FY19 Congressional add of \$54 million. | | | |
| Accomplishments/Planned Programs Subtotals | 111.138 | 216.844 | 181.663 |

| D. Other Program Funding Summary (\$ in Millions) | | | | | | | | | | | |
|--|----------------|----------------|---------------------|--------------------|----------------------|----------------|----------------|----------------|----------------|-------------------------|-------------------|
| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020 Base</u> | <u>FY 2020 OCO</u> | <u>FY 2020 Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To Complete</u> | <u>Total Cost</u> |
| • RDTE 06 PE 0604256F: <i>Threat Simulator Development</i> | 34.777 | 34.206 | 59.693 | - | 59.693 | 63.925 | 44.844 | 36.577 | 31.717 | Continuing | Continuing |
| • RDTE 06 PE 0605807F: <i>Test and Evaluation Support</i> | 735.688 | 692.784 | 717.895 | - | 717.895 | 721.615 | 761.252 | 765.736 | 779.877 | Continuing | Continuing |
| • RDTE 06 PE 0605976F: <i>Facility Restoration & Modernization - T&E</i> | 135.507 | 187.216 | 88.445 | - | 88.445 | 69.293 | 70.730 | 72.019 | 73.315 | Continuing | Continuing |
| • RDTE 06 PE 0605978F: <i>Facility Sustainment - T&E Support</i> | 28.720 | 28.888 | 29.424 | - | 29.424 | 29.935 | 30.555 | 31.112 | 31.673 | Continuing | Continuing |

Remarks

E. Acquisition Strategy
N/A

F. Performance Metrics
Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|----------------------------------|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 33.089 | 34.614 | 35.258 | 0.000 | 35.258 | 35.869 | 36.614 | 37.282 | 37.953 | Continuing | Continuing |
| 661110: <i>Project Air Force</i> | - | 33.089 | 34.614 | 35.258 | 0.000 | 35.258 | 35.869 | 36.614 | 37.282 | 37.953 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

This program provides for continuing analytical research across a broad spectrum of aerospace issues and concerns. The Project AIR FORCE (PAF) research agenda is focused primarily on mid to long-term problems; in addition, PAF provides quick response assistance for senior Air Force officials on high priority, near term issues. Within these areas, PAF addresses difficult and complex, far-reaching and inter-related questions linked to future strategies, approaches and policies, in order to enhance Air Force senior leadership's deliberations and decisionmaking on major issues. The Air Force Steering Group, chaired by the Vice Chief of Staff, reviews, monitors, and approves PAF annual research efforts. Each project is initiated, processed, and approved in accordance with PAF Sponsoring Agreement which requires General Officer (or SES equivalent) sponsorship and involvement on a continuing basis.

PAF is organized in four primary research program areas: strategy and doctrine; force modernization employment; manpower, personnel and training; and resource management. Integrative research projects are also conducted at the division level with direct support provided through the most applicable program. Research programs address organizational crosscutting issues as defined by specific research themes approved by the Air Force Steering Group. These research themes encompass a wide spectrum of topics including external challenges to national security; terrorism and homeland defense; joint and coalition operations; integrated roadmap for ISR capabilities; enhancing, tailoring and reducing infrastructure to meet new force requirements; potential changes to the Active/Reserve/National Guard/Civilian/Contractor manpower mix; and improved weapon system costing.

The research program will continue to build upon research foundations, examining the evolving security environment, emerging threats, national and military strategy, transformation approaches including investment strategies to provide capabilities within changing Defense budgets, operational concepts to meet evolving and increasingly joint missions, exploiting advanced technologies, increasing the effectiveness and efficiency of combat support, and developing the total force (Active/Reserve/National Guard/Civilian/Contractor). These efforts will continue to inform and support the senior Air Force leadership regarding personnel management and training; improving logistical efficiencies and force sustainment; ongoing conflicts and joint operations; force structure capabilities, limitations, and operational concepts; and making force structure tradeoffs within resource constraints to meet future national security and Air Force needs.

Future research will build upon earlier work to continue to help the Air Force to rapidly and appropriately adapt to the changing world environment and emerging threats; continue to modernize and employ its force structure to provide capabilities within changing DoD budgets; assess lessons learned from recent and ongoing conflicts; develop and utilize its total force; and enhance the support of our aerospace forces, ranging from sustainment of the force structure to agile combat support.

PAF research spans functional and organizational boundaries and is managed in a manner to facilitate independence and freedom from organizational bias thereby providing perspectives and insights to senior Air Force leaders free from parochial influences not necessarily in the best interest of the Air Force at large. Benefits of

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0605101F / <i>RAND Project Air Force</i> |
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independent non-Department of Defense analysis of complex present day and emerging issues are shared beyond the immediacy of the Air Force. PAF study results are given wide dissemination within the DOD on a routine basis and are deposited with the Defense Technical Information Center available to a broad range of qualified government and commercial-sector individuals and activities.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 6, RDT&E Management Support because this budget activity includes research, development, test and evaluation efforts and funds to sustain and/or modernize the installations or operations required for general research, development, test and evaluation.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 34.346 | 34.614 | 35.258 | 0.000 | 35.258 |
| Current President's Budget | 33.089 | 34.614 | 35.258 | 0.000 | 35.258 |
| Total Adjustments | -1.257 | 0.000 | 0.000 | 0.000 | 0.000 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -1.257 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| Title: Strategy & Doctrine | 7.716 | 8.200 | 8.300 | 0.000 | 8.300 |
| Description: Provides for continuing analytical research across a broad spectrum of aerospace issues and concerns--strategy and doctrine. | | | | | |
| FY 2019 Plans: Conduct continuing analytical research across a broad spectrum of aerospace issues and concerns--integrative research/direct support. | | | | | |
| FY 2020 Base Plans: | | | | | |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | | | Date: February 2019 | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | | R-1 Program Element (Number/Name) PE 0605101F / <i>RAND Project Air Force</i> | | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | | | | |
| | | | | | |
| Will conduct continuing analytical research across a broad spectrum of aerospace issues and concerns--integrative research/direct support. | | | | | |
| FY 2020 OCO Plans: N/A | | | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: Increased to account for inflation. | | | | | |
| Title: Force Development | | | | | |
| Description: Provides analytical research across a broad spectrum of aerospace issues and concerns--force development employment. | | | | | |
| FY 2019 Plans: Provide for continuing analytical research across a broad spectrum of aerospace issues and concerns--force development employment. | | | | | |
| FY 2020 Base Plans: Will provide for continuing analytical research across a broad spectrum of aerospace issues and concerns--force development employment. | | | | | |
| FY 2020 OCO Plans: N/A | | | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: Increased to account for inflation. | | | | | |
| Title: Manpower, Personnel & Training | | | | | |
| Description: Provides analytical research across a broad spectrum of aerospace issues and concerns--manpower, personnel and training. | | | | | |
| FY 2019 Plans: Conduct continuing analytical research across a broad spectrum of aerospace issues and concerns--manpower, personnel and training. | | | | | |
| FY 2020 Base Plans: | | | | | |
| | 8.805 | 8.202 | 8.340 | 0.000 | 8.340 |
| | 7.716 | 8.202 | 8.340 | 0.000 | 8.340 |

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| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|---------|---------|--------------|-------------|---------------|
|---|---------|---------|--------------|-------------|---------------|

| | | | | | |
|--|--|--|--|--|--|
| Will conduct continuing analytical research across a broad spectrum of aerospace issues and concerns--manpower, personnel and training. FY 2020 OCO Plans: N/A FY 2019 to FY 2020 Increase/Decrease Statement: Increased to account for inflation. | | | | | |
|--|--|--|--|--|--|

| | | | | | |
|---|-------|-------|-------|-------|-------|
| Title: Resource Management Description: Provides analytical research across a broad spectrum of aerospace issues and concerns--resource management. FY 2019 Plans: Conduct continuing analytical research across a broad spectrum of aerospace issues and concerns--manpower, personnel and training. FY 2020 Base Plans: Will conduct continuing analytical research across a broad spectrum of aerospace issues and concerns--manpower, personnel and training. FY 2020 OCO Plans: N/A FY 2019 to FY 2020 Increase/Decrease Statement: Increased to account for inflation. | 7.152 | 8.202 | 8.340 | 0.000 | 8.340 |
|---|-------|-------|-------|-------|-------|

| | | | | | |
|---|-------|-------|-------|-------|-------|
| Title: Integrative Research/Direct Support Description: Provides for continuing analytical research across a broad spectrum of aerospace issues and concerns--integrative research/direct support. FY 2019 Plans: Conduct continuing analytical research across a broad spectrum of aerospace issues and concerns--integrative research/direct support. FY 2020 Base Plans: | 1.700 | 1.808 | 1.938 | 0.000 | 1.938 |
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| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|-------------------------|------------------------|--------------------------|
| Will conduct continuing analytical research across a broad spectrum of aerospace issues and concerns-- integrative research/direct support. | | | | | |
| <i>FY 2020 OCO Plans:</i> Increased to account for inflation. | | | | | |
| <i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> Increased to account for inflation. | | | | | |
| Accomplishments/Planned Programs Subtotals | 33.089 | 34.614 | 35.258 | 0.000 | 35.258 |

D. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

E. Acquisition Strategy

N/A

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force</i> / BA 6: <i>RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0605502F / <i>Small Business Innovation Research</i> |
|--|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 663.657 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| 663005: <i>Small Business Innovation Research</i> | - | 663.657 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

Implementation of 15 U.S.C., Section 638 to maximize the creative, innovative, and entrepreneurial spirit of small businesses to solve technological problems.

The budget for this program is implemented after an appropriation is passed as directed in provisions of 15 U.S.C., Section 638.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 6, RDT&E Management Support because this budget activity includes research, development, test and evaluation efforts and funds to sustain and/or modernize the installations or operations required for general research, development, test and evaluation.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Current President's Budget | 663.657 | 0.000 | 0.000 | 0.000 | 0.000 |
| Total Adjustments | 663.657 | 0.000 | 0.000 | 0.000 | 0.000 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | 663.657 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

C. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|---|---------|---------|---------|
| Title: Small Business Innovation Research & Small Business Technology Transfer | 663.657 | 0.000 | 0.000 |

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0605502F / <i>Small Business Innovation Research</i> |
|---|---|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| <p>Description: Implements 15 U.S.C., Section 638 for Air Force Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) efforts.</p> <p>This effort was renamed from Small Business Innovation Research to encompass all 15 U.S.C., Section 638 efforts.</p> <p>FY 2019 Plans: The budget for this program is implemented after an appropriation is passed as directed in provisions of 15 U.S.C., Section 638.</p> <p>FY 2020 Plans: Not Applicable</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Not Applicable</p> | | | |
| Accomplishments/Planned Programs Subtotals | 663.657 | 0.000 | 0.000 |

D. Other Program Funding Summary (\$ in Millions)
N/A

Remarks

E. Acquisition Strategy
N/A

F. Performance Metrics
Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0605712F / <i>Initial Operational Test & Evaluation</i> |
|---|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|--|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 15.523 | 18.043 | 13.793 | 0.000 | 13.793 | 16.497 | 16.754 | 14.513 | 14.445 | Continuing | Continuing |
| 660191: <i>Initial Operational Test and Eval</i> | - | 15.523 | 18.043 | 13.793 | 0.000 | 13.793 | 16.497 | 16.754 | 14.513 | 14.445 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

This program element funds Congressionally mandated Initial Operational Test and Evaluation (IOT&E) to support major weapon system acquisition decisions beyond Low-Rate Initial Production (LRIP), Milestone C, full rate production, fielding, and declaration of Initial Operational Capability (IOC). For Major Defense Acquisition Programs (MDAP), the law requires IOT&E be completed under realistic operating conditions before proceeding beyond LRIP. IOT&E will be planned to answer all critical operational issues (COI) as thoroughly as possible. IOT&E is conducted to determine the operational effectiveness and suitability and resolve overall mission capability of systems undergoing research and development (R&D) efforts. It is an evaluation of a system's performance when the complete system is tested and evaluated against operational criteria by personnel with the same qualifications as those who will operate, maintain and support the system when deployed. In general, IOT&E is performed on new systems in development, major modifications, and other systems as directed. This PE funds the Air Force Operational Test Agency's participation in Integrated Test and Evaluation (IT&E), Multiservice Operational Test and Evaluation (MOT&E), and Follow-on Operational Test and Evaluation (FOT&E) when it is the continuation of IOT&E activities past the full rate production decision. FOT&E answers specific questions about unresolved COIs and test issues or completes areas not finished during the IOT&E. This PE also funds related operational test and evaluation (OT&E) activities such as Early Influence, Operational Utility Evaluations (OUE), Early Operational Assessments (EOA), and Operational Assessments (OA) which are independent OT&Es supporting major milestones and decision points prior to Milestone C, full rate production, fielding, or declaration of IOC. IOT&E programs are identified in several system categories: Air; Space; Weapons; Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR); and Combat Support. This program element is driven by Congressional and DoD acquisition mandated requirements for operational testing. AFOTEC schedules and executes tests according to the forecasted test readiness of the MDAP program offices.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 6, RDT&E Management Support because this budget activity includes research, development, test and evaluation efforts and funds to sustain and/or modernize the installations or operations required for general research, development, test and evaluation.

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | | R-1 Program Element (Number/Name) PE 0605712F / <i>Initial Operational Test & Evaluation</i> | | | | |
| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | |
| Previous President's Budget | 15.523 | 18.043 | 13.793 | 0.000 | 13.793 | |
| Current President's Budget | 15.523 | 18.043 | 13.793 | 0.000 | 13.793 | |
| Total Adjustments | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | |
| • Congressional General Reductions | 0.000 | 0.000 | | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | | |
| • Congressional Adds | 0.000 | 0.000 | | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | | |
| • Reprogrammings | 0.000 | 0.000 | | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | | |
| • Other Adjustments | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | | | FY 2018 | FY 2019 | FY 2020 |
| Title: Air Systems OT&E | | | | 5.415 | 2.397 | 5.140 |
| Description: Plan, execute and report OT&E for Air Systems | | | | | | |
| FY 2019 Plans: | | | | | | |
| -Advanced Pilot Training (APT T-X): Conduct OA | | | | | | |
| -Airborne Warning and Control System (AWACS) Block 40/45: Plan for FOT&E | | | | | | |
| -B-52 Commercial Engine Replacement Program (B-52 CERP): Conduct early influence | | | | | | |
| -B-52 Radar Modernization Program (B-52 RMP): Conduct early influence | | | | | | |
| -C-130J Block Upgrade 8.1: Complete IOT&E | | | | | | |
| -Combat Rescue Helicopter (CRH): Conduct OA | | | | | | |
| -(Diminishing Manufacturing Sources) Replacement of Avionics for Global Operations and Navigation (E-3 DRAGON): Conduct IOT&E | | | | | | |
| -F-15 Eagle Passive and Active Warning and Survivability System (F-15 EPAWSS): Plan for OA | | | | | | |
| -F-15 Infrared Search and Track System (F-15 IRST): Conduct OA | | | | | | |
| -Global Hawk Ground Segment Modernization Program GH GSMP): Conduct OA | | | | | | |
| -JSTARS Recapitalization: Conduct OA | | | | | | |
| -KC-46A: Conduct IOT&E | | | | | | |
| -MQ-9 Reaper Hunter-Killer Block 50 Ground Control Station (MQ-9 Block 50 GCS): Plan for OA | | | | | | |
| -RQ-4B Global Hawk Block 30 Multi-Spectral Intelligence (MSI): Conduct OUE | | | | | | |
| -UH-1N Replacement: Plan for OA | | | | | | |
| -VC-25B (formerly PAR): Plan for OA | | | | | | |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | | R-1 Program Element (Number/Name) PE 0605712F / <i>Initial Operational Test & Evaluation</i> | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| <p>-Conduct other planning and operational testing for new air system programs as the requirement becomes known to AFOTEC</p> <p>FY 2020 Plans:</p> <ul style="list-style-type: none"> -Advanced Pilot Training (APT T-X): Plan for OA2 -Airborne Warning and Control System (AWACS) Block 40/45: Conduct FOT&E -B-52 Commercial Engine Replacement Program (B-52 CERP): Conduct early influence -B-52 Radar Modernization Program (B-52 RMP): Conduct early influence -Combat Rescue Helicopter (CRH): Plan for IOT&E -F-15 Eagle Passive and Active Warning and Survivability System (F-15 EPAWSS): Conduct OA -F-15 Infrared Search and Track System (F-15 IRST): Complete OA -Global Hawk Ground Segment Modernization Program GH GSMP): Plan for IOT&E -JSTARS Recapitalization: Plan for OA2 -KC-46A: Complete IOT&E -MQ-9 Reaper Hunter-Killer Block 50 Ground Control Station (MQ-9 Block 50 GCS): Conduct OA -RQ-4B Global Hawk Block 30 Multi-Spectral Intelligence (MSI): Plan for IOT&E -UH-1N Replacement: Conduct OA -VC-25B (formerly PAR): Conduct OA -Conduct other planning and operational testing for new air system programs as the requirement becomes known to AFOTEC <p>FY 2019 to FY 2020 Increase/Decrease Statement: Increase due to more extensive requirements and thus more costly scheduled test work.</p> | | | | |
| <p>Title: Space Systems OT&E</p> <p>Description: Plan, execute and report OT&E for Space Systems</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none"> -Advanced Extremely High Frequency Satellite Communications (Advanced EHF): Conduct early influence -Airborne Launch Control System Replacement (ALCS-R): Plan for EOA -Enhanced Polar System (EPS): Conduct MOT&E -Evolved Strategic SATCOM (ESS): Conduct early influence -Global Positioning System Block III (GPS III): Plan for OUE -Military GPS User Equipment (GPS MGUE): Conduct OA -Global Positioning System III Contingency Operations (GPS III COps): Plan for OUE -Global Positioning System Military-Code Early Use (GPS MCEU): Plan for OUE -GPS Next Generation Control Segment (GPS OCX): Conduct early influence | | 3.090 | 1.296 | 1.956 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | | R-1 Program Element (Number/Name) PE 0605712F / <i>Initial Operational Test & Evaluation</i> | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| <ul style="list-style-type: none"> -Integrated Strategic Planning and Analysis Network Increment 5 (ISPAN Inc 5): Conduct agile release tests -Joint Space Operations Center (JSpOC) Mission System (JMS): Conduct IOT&E -Long-Range Discrimination Radar (LRDR): Conduct early influence -Next-Generation Overhead Persistent Infrared (Next-Gen OPIR): Conduct early influence -Protected Tactical Enterprise Service (PTES): Conduct MOT&E -Protected Tactical SATCOM (PTS): Conduct early influence -Space Based Infrared System (SBIRS): Conduct IOT&E -Space Fence: Conduct IOT&E -Weather System Follow-On Microwave (WSF-M): Conduct EOA -Conduct other planning and operational testing for new space system programs as the requirement becomes known to AFOTEC -Conduct other planning and operational testing for new space system programs as the requirement becomes known to AFOTEC <p>FY 2020 Plans:</p> <ul style="list-style-type: none"> -Advanced Extremely High Frequency Satellite Communications (Advanced EHF): Conduct early influence -Airborne Launch Control System Replacement (ALCS-R): Conduct EOA -Evolved Strategic SATCOM (ESS): Conduct early influence -Global Positioning System Block III (GPS III): Conduct OUE -Military GPS User Equipment (GPS MGUE): Plan for OUE -Global Positioning System III Contingency Operations (GPS III COps): Conduct OUE -Global Positioning System Military-Code Early Use (GPS MCEU): Conduct OUE -GPS Next Generation Control Segment (GPS OCX): Conduct early influence -Integrated Strategic Planning and Analysis Network Increment 5 (ISPAN Inc 5): Conduct agile release tests -Long-Range Discrimination Radar (LRDR): Plan for IOT&E -Next-Generation Overhead Persistent Infrared (Next-Gen OPIR): Conduct early influence -Protected Tactical Enterprise Service (PTES): Complete MOT&E -Protected Tactical SATCOM (PTS): Plan for EOA -Space Based Infrared System (SBIRS): Plan for IOT&E2 -Weather System Follow-On Microwave (WSF-M): Plan for OA -Conduct other planning and operational testing for new space system programs as the requirement becomes known to AFOTEC <p>FY 2019 to FY 2020 Increase/Decrease Statement: Increase due to more extensive requirements and thus more costly scheduled test work.</p> | | | | |
| Title: Weapons Systems OT&E | | 5.531 | 5.101 | 2.607 |
| Description: Plan, execute and report OT&E for Weapons Systems | | | | |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | | R-1 Program Element (Number/Name) PE 0605712F / <i>Initial Operational Test & Evaluation</i> | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| <p>FY 2019 Plans:</p> <ul style="list-style-type: none"> -AIM-120C Advanced Electronic Protection Improvement Program (AIM-120C Advanced EPIP): Complete MOT&E 2 -AIM 120D System Improvement Program 3 (AIM-120D SIP-3): Plan for MOT&E -AIM-9X Block II 9.4xx (AIM-9X Blk II 9.4xx): Plan for FOT&E -B61 Life Extension Program (B-61 LEP): Conduct IOT&E -Electronic Bomb Fuze FMU-139D/B (FMU-139D/B): Conduct OUE -Hypersonic Conventional Strike Weapon (HCSW): Plan for OUE -Inter-Continental Ballistic Missile Fuze (ICBM FUZE): Plan for OA -Mk21A Reentry Vehicle (Mk21A RV): Conduct early influence -Small Diameter Bomb II (SDB II): Complete MOT&E -Conduct other planning and operational testing for new weapons system programs as the requirement becomes known to AFOTEC <p>FY 2020 Plans:</p> <ul style="list-style-type: none"> -AIM 120D System Improvement Program 3 (AIM-120D SIP-3): Conduct MOT&E -AIM-9X Block II 9.4xx (AIM-9X Blk II 9.4xx): Conduct FOT&E -Electronic Bomb Fuze FMU-139D/B (FMU-139D/B): Complete OUE -Hypersonic Conventional Strike Weapon (HCSW): Conduct OUE -Inter-Continental Ballistic Missile Fuze (ICBM FUZE): Conduct OA -Mk21A Reentry Vehicle (Mk21A RV): Plan for EOA -Small Diameter Bomb II (SDB II): Conduct MOT&E2 -Conduct other planning and operational testing for new weapons system programs as the requirement becomes known to AFOTEC <p>FY 2019 to FY 2020 Increase/Decrease Statement: Decrease due to less extensive requirements and thus less costly scheduled test work.</p> | | | | |
| <p>Title: C4ISR Systems OT&E</p> <p>Description: Plan, execute and report OT&E for C4ISR Systems</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none"> -Air Force Integrated Personnel and Pay System (AFIPPS): Plan for IOT&E -AN/TPS-81 (Three Dimensional Expeditionary Long Range Radar (3DELRR)): Conduct early influence -Air Operations Center Weapon System Modification Program (AOC WS Mod): Conduct OA -Distributed Common Ground System (DCGS): Conduct OUEs 19-1, 19-2, 19-3, 19-4 | | 1.042 | 4.152 | 3.461 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | | R-1 Program Element (Number/Name) PE 0605712F / <i>Initial Operational Test & Evaluation</i> | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| <ul style="list-style-type: none"> -Family of Advanced Beyond Line Of Sight Terminals (FAB T): Conduct early influence -Nuclear Planning and Execution System Recapitalization (NPES): Conduct Release Tests -Presidential and National Voice Conferencing (PNVC): Conduct early influence -RQ-4 Global Hawk Block 30/Airborne Signals Intelligence Payload (ASIP): Conduct FOT&E -Wide Area Surveillance (WAS): Conduct IOT&E and FOT&E -Conduct other planning and operational testing for new C4ISR programs as the requirement becomes known to AFOTEC <p>FY 2020 Plans:</p> <ul style="list-style-type: none"> -Air Force Integrated Personnel and Pay System (AFIPPS): Conduct IOT&E -AN/TPS-81 (Three Dimensional Expeditionary Long Range Radar (3DELRR)): Plan for OA -Air Operations Center Weapon System Modification Program (AOC WS Mod): Conduct OUE -Distributed Common Ground System (DCGS): Conduct OUEs 20-1, 20-2, 20-3, 20-4 -Family of Advanced Beyond Line Of Sight Terminals (FAB T): Plan for FOT&E -Nuclear Planning and Execution System Recapitalization (NPES): Conduct Release tests -Presidential and National Voice Conferencing (PNVC): Plan for MOT&E -RQ-4 Global Hawk Block 30/Airborne Signals Intelligence Payload (ASIP): Complete FOT&E -Wide Area Surveillance (WAS): Complete FOT&E -Conduct other planning and operational testing for new C4ISR programs as the requirement becomes known to AFOTEC <p>FY 2019 to FY 2020 Increase/Decrease Statement: Decrease due less extensive requirements and thus less costly scheduled test work.</p> | | | | |
| <p>Title: Combat Support OT&E</p> <p>Description: Plan, execute and report OT&E for Combat Support OT&E</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none"> -Common Munitions Built-In Test Reprogramming Equipment Service Life Extension Program (CMBRE SLEP): Conduct early influence -Deliberate and Crisis Action Planning and Execution Segments Increment 2B (DCAPES Inc 2B): Conduct OUE 1 -Integrated Aircrew Ensemble (IAE): Conduct IOT&E -Maintenance, Repair, and Overhaul Initiative (MROI): Plan for IOT&E -Conduct other planning and operational testing for new combat support programs as the requirement becomes known to AFOTEC <p>FY 2020 Plans:</p> <ul style="list-style-type: none"> -Common Munitions Built-In Test Reprogramming Equipment Service Life Extension Program (CMBRE SLEP): Plan for OUE | | 0.445 | 0.134 | 0.629 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0605712F / <i>Initial Operational Test & Evaluation</i> |
|---|--|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|---------|---------|---------|
| -Deliberate and Crisis Action Planning and Execution Segments Increment 2B (DCAPES Inc 2B): Conduct OUE 2 -Maintenance, Repair, and Overhaul Initiative (MROI): Conduct IOT&E -Conduct other planning and operational testing for new combat support programs as the requirement becomes known to AFOTEC FY 2019 to FY 2020 Increase/Decrease Statement: Increase due to more extensive requirements and thus more costly scheduled test work. | | | |
| Title: NDAA 1647 Cyber Testing Description: Plan and execute Congressional, DoD and Air Force mandated cyber security testing on AFOTEC programs for NDAA 1647 effort. FY 2019 Plans: Execute cyber testing as referenced in NDAA 1647 initiative. FY 2020 Plans: None FY 2019 to FY 2020 Increase/Decrease Statement: NDAA 1647 initiative ends in FY19. | 0.000 | 4.963 | 0.000 |
| Accomplishments/Planned Programs Subtotals | 15.523 | 18.043 | 13.793 |

D. Other Program Funding Summary (\$ in Millions)
N/A

Remarks

E. Acquisition Strategy
N/A

F. Performance Metrics
Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0605807F / <i>Test and Evaluation Support</i> |
|---|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|--|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 735.688 | 692.784 | 717.895 | 0.000 | 717.895 | 721.615 | 761.252 | 765.736 | 779.877 | Continuing | Continuing |
| 6606TG: <i>704th Test Group</i> | - | 37.485 | 37.558 | 37.948 | 0.000 | 37.948 | 38.633 | 44.843 | 43.956 | 41.282 | Continuing | Continuing |
| 6606TS: <i>Test and Evaluation Support</i> | - | 698.203 | 655.226 | 679.947 | 0.000 | 679.947 | 682.982 | 716.409 | 721.780 | 738.595 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

This program element provides resources to operate the Air Force Test Center (AFTC) test activities which are included in the Department of Defense (DoD) Major Range and Test Facility Base (MRTFB). Test facilities/capabilities include wind tunnels, rocket and jet engine test cells, hypersonic and subsonic testing, modeling and simulation, technology, limited space environmental simulation chambers, armament test ranges, hardware-in-the-loop test facilities, climatic test facilities, avionics test facilities, aircraft testbeds, dry lake bed landing sites, instrumented test ranges, and test aircraft maintenance, as well as USAF Test Pilot School.

Test and Evaluation (T&E) Support funds institutional test infrastructure activities including: Command and supervisory staffs; supply stocks; maintenance, repair, and replacement of worn or obsolete test equipment and facilities; test infrastructure for data collection, transmission, reduction, and analysis; civilian salaries; temporary duty travel; range operations and material support contract costs for hardware and software engineering and maintenance; and minor improvement and modernization projects. It also funds institutional test aircraft depot level maintenance such as: Programmed Depot Maintenance (PDM), the calendar-based cyclic scheduling of aircraft into depots for update/inspection; modifications and any other depot level repairs required by the aircraft System Program Directors (SPD); engine overhauls; depot-provided area assistance; and assorted ground support equipment overhauls.

Within AFTC there are three test wings. The first is Arnold Engineering and Development Complex (AEDC), located at Arnold Air Force Base (AFB), TN. The AEDC institutional test infrastructure supports operations of the largest complex of ground test facilities in the world (including transonic, supersonic, and hypersonic wind tunnels; rocket motor and turbine engine test cells; space environmental test chambers, hyper ballistic ranges; and other specialized facilities). AEDC also supports geographically separated facilities which include the National Full-Scale Aerodynamic Complex (NFAC) located at NASA's AMES Research Center, California, Tunnel 9 located at White Oak, Maryland, and the McKinley Climatic Lab located on Eglin AFB, Florida. The 412 Test Wing (TW) is located at Edwards AFB, CA. Its institutional test infrastructure supports weapons system development and operational test and evaluation for aircraft, aircraft subsystems and aircraft weapon systems, aerospace research vehicles, unmanned miniature vehicles, cruise missiles, parachute delivery/recovery systems, cargo handling systems, communications, information operations, and Electronic Warfare (EW) systems for DoD and allied forces. The 412TW mission also includes the USAF Test Pilot School. Lastly, the 96 TW, located at Eglin AFB, FL, is a joint test and training complex comprised of 724 square miles of land area, and approximately 123,000 square miles of water area. The 96TW provides the institutional test infrastructure required to conduct developmental and operational test and evaluation of non-nuclear air armaments (including aircraft guns, ammunition, and air-to-surface and air-to-air guided munitions); Command, Control, Communications, Computers and Intelligence/Surveillance/Reconnaissance (C4ISR) systems; target acquisition and weapon delivery systems; and special operations aircraft systems. 96TW provides a scientific test process that supports the development, production, sustainment, and enhancement of munitions systems that support tri-service digital weapons development. T&E support services contracts are awarded on the basis of full and open competition.

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0605807F / <i>Test and Evaluation Support</i> |
|---|--|

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 6, RDT&E Management Support because this budget activity includes research, development, test and evaluation efforts and funds to sustain and/or modernize the installations or operations required for general research, development, test and evaluation.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 678.289 | 692.784 | 719.900 | 0.000 | 719.900 |
| Current President's Budget | 735.688 | 692.784 | 717.895 | 0.000 | 717.895 |
| Total Adjustments | 57.399 | 0.000 | -2.005 | 0.000 | -2.005 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 57.399 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | -2.005 | 0.000 | -2.005 |

Change Summary Explanation

FY18: Test and Evaluation Support received \$57.4 million in Congressional adds. \$23.0 million was provided for a one-time increase to the Flying Hour Program to supports the AFMC test fleet. \$4.4 million was a program increase to support weapon system cyber resiliency test and evaluation. The remaining \$30.0 million was a general program increase that is being used to address budget shortfalls in areas such as facility security upgrades and operations.

FY20: \$2.005 million decrease due to civ pay reprice (\$3.633 million decrease), fuel reprice (\$1.820 million increase), and increase of 0.060 million to support the Dynamic Radar Cross Section (RCS) Range investment.

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 6 | | | | | R-1 Program Element (Number/Name) PE 0605807F / <i>Test and Evaluation Support</i> | | | | Project (Number/Name) 6606TG / <i>704th Test Group</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 6606TG: <i>704th Test Group</i> | - | 37.485 | 37.558 | 37.948 | 0.000 | 37.948 | 38.633 | 44.843 | 43.956 | 41.282 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

Project infrastructure support is provided for the unique capabilities of the 704th Test Group (TG) facilities: Central Inertial and Global Positioning System (GPS) Test Facility (CIGTF/746th Test Squadron), the Holloman High Speed Test Track (HHSTT/846th Test Squadron) and the National Radar Cross Section (RCS) Test Facility (NRTF/704 TG Det 2), the 586th Flight Test Squadron including Detachment 1 (Det 1), 704 TG Operating Location (704 TG OL-AA) at Kirtland AFB, and 704 TG Operation Location (704 TG OL-AC) at Wright-Patterson AFB.

CIGTF provides independent test and evaluation of inertial, Global Positioning System, and integrated systems used for aircraft navigation and missile guidance systems, including vulnerability to electronic interference.

HHSTT capabilities include full-scale testing in flight representative environments, realistic live-fire simulations, test item and target fragment recovery, precision trajectory analysis and high speed photography.

NRTF provides radar cross section (RCS) monostatic and bistatic amplitude and phase measurements, antenna pattern measurements, glint and near field measurements for low observable targets.

The 586th Flight Test Squadron executes flight test and test support for advanced avionics and weapons development of joint, international and commercial test programs. Det 1 provides the liaison function for coordinating and scheduling all US Air Force test and training operations at White Sands Missile Range (WSMR). OL-AA provides test support for the Air Force Research Lab (AFRL) Directed Energy Division.

The 704 TG OL-AC includes the Landing Gear Test Facility (LGTF) with capabilities such as variable and fixed inertia dynamometers, compression/tension load applicators, 4 drop towers, a burst pit and a dynamic load simulator. The 704 TG OL-AC also includes the Air Vehicle Survivability Office that provides support for Air Force aircraft acquisition programs. The 704th TG support services contracts are awarded on the basis of full and open competition.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| Title: 704th Test Group | 37.485 | 37.558 | 37.948 |
| Description: Provide infrastructure at the 704th Test Group (TG) to support testing of DoD, other Government Agencies, foreign military sales, and commercial weapon systems. | | | |
| FY 2019 Plans: | | | |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | Date: February 2019 |
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|--|--|--|
| Appropriation/Budget Activity 3600 / 6 | R-1 Program Element (Number/Name) PE 0605807F / <i>Test and Evaluation Support</i> | Project (Number/Name) 6606TG / <i>704th Test Group</i> |
|--|--|--|

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|---------|---------|---------|
| Total consists of utilities, contractor services, and civilian pay. | | | |
| <i>FY 2020 Plans:</i> Total consists of utilities, contractor services, and civilian pay. | | | |
| <i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> Not applicable. | | | |
| Accomplishments/Planned Programs Subtotals | 37.485 | 37.558 | 37.948 |

C. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not applicable

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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|---|--------------------|----------------|----------------|---------------------|--|----------------------|----------------|----------------|---|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 6 | | | | | R-1 Program Element (Number/Name) PE 0605807F / <i>Test and Evaluation Support</i> | | | | Project (Number/Name) 6606TS / <i>Test and Evaluation Support</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 6606TS: <i>Test and Evaluation Support</i> | - | 698.203 | 655.226 | 679.947 | 0.000 | 679.947 | 682.982 | 716.409 | 721.780 | 738.595 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

This project provides resources to operate the Air Force Test Center (AFTC) test activities which are included in the Department of Defense (DoD) Major Range and Test Facility Base (MRTFB). Test facilities/capabilities operated through this program include wind tunnels, rocket and jet engine test cells, hypersonic and subsonic testing, modeling and simulation, technology, limited space environmental simulation chambers, armament test ranges, hardware-in-the-loop test facilities, climatic test facilities, avionics test facilities, aircraft testbeds, dry lakebed landing sites, instrumented test ranges, and test aircraft maintenance, as well as USAF Test Pilot School.

Test and Evaluation (T&E) Support funds institutional test infrastructure activities including: Command and supervisory staffs; supply stocks; maintenance, repair, and replacement of worn or obsolete test equipment and facilities; test infrastructure for data collection, transmission, reduction, and analysis; civilian salaries; temporary duty travel; range operations and material support contract costs for hardware and software engineering and maintenance; and minor improvement and modernization projects. It also funds institutional test aircraft depot level maintenance such as: Programmed Depot Maintenance (PDM), the calendar-based cyclic scheduling of aircraft into depots for update/inspection; modifications and any other depot level repairs required by the aircraft System Program Directors (SPD); engine overhauls; depot-provided area assistance; and assorted ground support equipment overhauls.

The AFTCs three test wings are supported by this project: (1) Arnold Engineering and Development Complex (AEDC), located at Arnold Air Force Base (AFB), TN, whose institutional test infrastructure supports operations of the largest complex of ground test facilities in the world (includes transonic, supersonic, and hypersonic wind tunnels; rocket motor and turbine engine test cells; space environmental test chambers, hyperballistic ranges; and other specialized facilities). Included are operations at the National Full-Scale Aerodynamic Complex (NFAC) located at NASA's AMES Research Center, California as well as operations at Tunnel 9 located at White Oak, Maryland.(2) 412 Test Wing (TW), located at Edwards AFB, CA, whose institutional test infrastructure supports weapons system development and operational test and evaluation for aircraft, aircraft subsystems and aircraft weapon systems, aerospace research vehicles, unmanned miniature vehicles, cruise missiles, parachute delivery/recovery systems, cargo handling systems, communications, information operations, and Electronic Warfare (EW) systems for DoD and allied forces. The 412TW mission includes the USAF Test Pilot School. (3) 96 TW, located at Eglin AFB, FL, is a joint test and training complex of 724 square miles of land area, and approximately 123,000 square miles of water area. 96TW provides the institutional test infrastructure required to conduct developmental and operational test and evaluation of non-nuclear air armaments (including aircraft guns, ammunition, and air-to-surface and air-to-air guided munitions); Command, Control, Communications, Computers and Intelligence/Surveillance/Reconnaissance (C4ISR) systems; target acquisition and weapon delivery systems; the McKinley Climatic Lab, multi-service climatic simulation capability, located at Eglin AFB, FL; and special operations aircraft systems. 96TW provides a scientific test process that supports the development, production, sustainment, and enhancement of munitions systems that support tri-service digital weapons development. T&E support services contracts are awarded on the basis of full and open competition.

B. Accomplishments/Planned Programs (\$ in Millions)

| | | | |
|---------------------------------|----------------|----------------|----------------|
| | FY 2018 | FY 2019 | FY 2020 |
| Title: AEDC, 412TW, 96TW | 698.203 | 655.226 | 679.947 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600 / 6 | R-1 Program Element (Number/Name) PE 0605807F / <i>Test and Evaluation Support</i> | Project (Number/Name) 6606TS / <i>Test and Evaluation Support</i> |
|--|--|---|

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|---------|---------|---------|
| <p>Description: Provide infrastructure to support testing at Arnold Engineering and Development Complex (AEDC), the 412TW and USAF Test Pilot School at Edwards AFB, and the 96TW at Eglin AFB.</p> <p>FY 2019 Plans: Total consists of utilities, contractor services, civilian pay, and the test and evaluation flying hour program.</p> <p>FY 2020 Plans: Total consists of utilities, contractor services, civilian pay, and the test and evaluation flying hour program.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: \$24.721 million increase due to an increase in the F-15 Aircraft Flying Hour Program (\$5 Million), addition of Periodic Depot Maintenance funds for a B-1B Aircraft (\$8.8 Million), and increase for the Joint Simulation Environment (\$10.6 Million), with minor adjustments to pay, fuel, and inflation.</p> | | | |
| Accomplishments/Planned Programs Subtotals | 698.203 | 655.226 | 679.947 |

C. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not applicable.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0605826F / <i>Acq Workforce- Global Power</i> |
|---|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---------------------------------------|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 216.144 | 227.824 | 258.667 | 0.000 | 258.667 | 270.107 | 275.367 | 280.511 | 285.968 | Continuing | Continuing |
| 664127: <i>Acq Workforce - Direct</i> | - | 216.144 | 227.824 | 258.667 | 0.000 | 258.667 | 270.107 | 275.367 | 280.511 | 285.968 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

This program element is one of eight direct funded AFLCMC acquisition workforce program elements. The other seven AFLCMC acquisition workforce civilian pay program elements are 0605827F Global Vigilance and Combat Systems, 0605828F Global Reach, 0605829F Global Cyber, Network, and Business Systems, 0605830F Global Battle Management, 0605831F Capability Integration, 0605832F Advanced Program Technology, and 0605898F Management Headquarters.

The Air Force Life Cycle Management Center (AFLCMC) equips U.S. and allied forces with operational weapon systems in support of military and national security operations. The acquisition and product support workforce provides cutting edge weapon systems, sustainment capabilities, and is charged with providing management, tools, and technical and business capabilities needed to oversee acquisition programs throughout their life cycle. The direct funded acquisition workforce funded in this program element will support all phases of acquisition programs to include material solution analysis, technology development, engineering and manufacturing development, production and deployment, and operations and support. This funding does not include costs for base operating support civilian personnel. This program element supports both civilian pay and non-pay support requirements.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 6, RDT&E Management Support because this budget activity includes research, development, test and evaluation efforts and funds to sustain and/or modernize the installations or operations required for general research, development, test and evaluation.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support | R-1 Program Element (Number/Name) PE 0605826F I Acq Workforce- Global Power |
|--|---|

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 219.809 | 233.924 | 228.689 | 0.000 | 228.689 |
| Current President's Budget | 216.144 | 227.824 | 258.667 | 0.000 | 258.667 |
| Total Adjustments | -3.665 | -6.100 | 29.978 | 0.000 | 29.978 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | -3.665 | -6.100 | 29.978 | 0.000 | 29.978 |

Change Summary Explanation

The FY20 PB supports 1,908 authorizations, \$251.410M for civilian pay requirements and \$7.257M for non-pay requirements. The FY20 budgeted Average Work Year Cost (AWYC) is \$131,766. The \$29.978M FY20 (FY19 PB) to FY20 (FY20 PB) increase is due to 111 additional authorizations (\$14.626M), a budgeted AWYC increase (\$8.157M), and new non-pay increase (\$7.195M). The additional 111 authorizations in this program element are a result of 30 new authorizations for the Joint Strike Fighter (JSF) Fleet Management Office (FMO), 25 new authorizations for the Light Air Attack program, and 56 authorizations realigned from the Program Integration and Development Directorate due to workload transition within the Center. The budgeted AWYC increased approximately \$4.275K per authorization due to the FY19 PB not funding the FY20 authorizations to the estimated AWYC. Additional non-pay funding supports an inflation increase and operational support for the new JSF FMO.

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| Title: Acquisition Workforce - Civilian Pay | 216.091 | 227.762 | 251.410 |
| Description: The acquisition and product support workforce provides cutting edge weapon systems, sustainment capabilities, and is charged with providing management, tools, and technical and business capabilities needed to oversee Global Power acquisition programs throughout their life cycle. | | | |
| FY 2019 Plans: Fund the Global Power acquisition and product support workforce. | | | |
| FY 2020 Plans: Fund the Global Power acquisition and product support workforce. | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: | | | |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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|---|--|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0605826F / <i>Acq Workforce- Global Power</i> |
|---|--|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| <p>The \$17.548M FY19 to FY20 increase is due to 111 additional authorizations (\$14.626M) and an Average Work Year Cost (AWYC) increase (\$2.922M) due to inflation. The additional 111 authorizations in this program element are a result of 30 new authorizations for the Joint Strike Fighter (JSF) Fleet Management Office (FMO), 25 new authorizations for the Light Air Attack program, and 56 authorizations realigned from the Program Integration and Development Directorate due to workload transition within the Center. The FY19 budgeted AWYC was \$130,235. The FY20 budgeted AWYC is \$131,766. The AWYC increased approximately \$1.532K per authorization primarily due to OSD inflation rate increases between FY19 and FY20.</p> <p>Title: Acquisition Workforce - Non-Civilian Pay</p> <p>Description: The acquisition and product support workforce provides cutting edge weapon systems, sustainment capabilities, and is charged with providing management, tools, and technical and business capabilities needed to oversee Global Power acquisition programs throughout their life cycle.</p> <p>FY 2019 Plans: Fund the Global Power acquisition and product support workforce.</p> <p>FY 2020 Plans: Fund the Global Power acquisition and product support workforce.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: The \$7.195M FY20 (FY19 PB) to FY20 (FY20 PB) non-pay increase is due to inflation and to provide operational support funding for the new JSF FMO.</p> | 0.053 | 0.062 | 7.257 |
| Accomplishments/Planned Programs Subtotals | 216.144 | 227.824 | 258.667 |

D. Other Program Funding Summary (\$ in Millions)
N/A

Remarks

E. Acquisition Strategy
N/A

F. Performance Metrics
Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0605827F / <i>Acq Workforce- Global Vig & Combat Sys</i> |
|---|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---------------------------------------|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 225.854 | 256.617 | 251.992 | 0.000 | 251.992 | 255.165 | 261.737 | 267.561 | 273.579 | Continuing | Continuing |
| 664127: <i>Acq Workforce - Direct</i> | - | 225.854 | 256.617 | 251.992 | 0.000 | 251.992 | 255.165 | 261.737 | 267.561 | 273.579 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

This program element is one of eight direct funded AFLCMC acquisition workforce program elements. The other seven acquisition workforce civilian pay program elements are 0605826F Global Power, 0605828F Global Reach, 0605829F Global Cyber, Network, and Business Systems, 0605830F Global Battle Management, 0605831F Capability Integration, 0605832F Advanced Program Technology, and 0605898F Management Headquarters.

The Air Force Life Cycle Management Center (AFLCMC) equips U.S. and allied forces with operational weapon systems in support of military and national security operations. The acquisition and product support workforce provides cutting edge weapon systems, sustainment capabilities, and is charged with providing management, tools, and technical and business capabilities needed to oversee acquisition programs throughout their life cycle. The direct funded acquisition workforce funded in this program element will support all phases of acquisition programs to include material solution analysis, technology development, engineering and manufacturing development, production and deployment, and operations and support. This funding does not include costs for base operating support civilian personnel. These program elements support both civilian pay and non-pay support requirements.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 6, RDT&E Management Support because this budget activity includes research, development, test and evaluation efforts and funds to sustain and/or modernize the installations or operations required for general research, development, test and evaluation.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force</i> / BA 6: <i>RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0605827F / <i>Acq Workforce- Global Vig & Combat Sys</i> |
|--|---|

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 223.179 | 263.488 | 275.405 | 0.000 | 275.405 |
| Current President's Budget | 225.854 | 256.617 | 251.992 | 0.000 | 251.992 |
| Total Adjustments | 2.675 | -6.871 | -23.413 | 0.000 | -23.413 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | 2.675 | -6.871 | -23.413 | 0.000 | -23.413 |

Change Summary Explanation

The FY20 PB provides 1,959 authorizations. The FY20 budgeted Average Work Year Cost (AWYC) is \$128,582. The \$23.413M FY20 (FY19 PB) to FY20 (FY20 PB) decrease is due to 31 fewer authorizations (\$3.986M), a budgeted AWYC decrease (\$19.527M), and a non-civilian pay upward adjustment of \$0.100M. The loss of 31 authorizations in this program element is due to multiple incremental workload transitions within the Center. The budgeted AWYC decreased \$9.968K per authorization due to the FY19 PB not funding the FY20 authorizations to the estimated AWYC.

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
|---|----------------|----------------|----------------|

| | | | |
|--|---------|---------|---------|
| Title: Acquisition Workforce - Civilian Pay | 225.854 | 256.617 | 251.892 |
| Description: The acquisition and product support workforce provides cutting edge weapon systems, sustainment capabilities, and is charged with providing management, tools, and technical and business capabilities needed to oversee Global Vigilance and Combat System acquisition programs throughout their life cycle. | | | |
| FY 2019 Plans: Fund the Global Vigilance and Combat System acquisition and product support workforce. | | | |
| FY 2020 Plans: Fund the Global Vigilance and Combat System acquisition and product support workforce. | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: The \$11.596M FY19 to FY20 decrease is due to 19 fewer authorizations (\$2.443M), and an Average Work Year Cost (AWYC) decrease (\$9.153M). The loss of 19 authorizations in this program element is due to workload transition within the Center. The FY19 budgeted AWYC was \$133,254. The FY20 budgeted AWYC is \$128,582. The AWYC decreased by approximately \$4.672K | | | |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | | R-1 Program Element (Number/Name) PE 0605827F / <i>Acq Workforce- Global Vig & Combat Sys</i> | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| per authorization primarily due to a shift in the demographics as more personnel are retiring and being replaced with lower grade trainees and new hires. | | | | |
| Title: Acquisition Workforce - Non-Civilian Pay | | 0.000 | 0.000 | 0.100 |
| Description: The acquisition and product support workforce provides cutting edge weapon systems, sustainment capabilities, and is charged with providing management, tools, and technical and business capabilities needed to oversee Global Vigilance and Combat System acquisition programs throughout their life cycle. | | | | |
| FY 2019 Plans: Fund the Global Vigilance and Combat System acquisition and product support workforce. | | | | |
| FY 2020 Plans: Fund the Global Vigilance and Combat System acquisition and product support workforce. | | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: The \$0.100M FY20 (FY19 PB) to FY20 (FY20 PB) non-pay increase is due to additional operational support requirements. | | | | |
| Accomplishments/Planned Programs Subtotals | | 225.854 | 256.617 | 251.992 |
| D. Other Program Funding Summary (\$ in Millions) N/A | | | | |
| Remarks | | | | |
| E. Acquisition Strategy N/A | | | | |
| F. Performance Metrics Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission. | | | | |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | | | | | R-1 Program Element (Number/Name) PE 0605828F / <i>Acq Workforce- Global Reach</i> | | | | | | | |
|---|--------------------|----------------|----------------|---------------------|--|----------------------|----------------|----------------|----------------|----------------|-------------------------|-------------------|
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| Total Program Element | - | 138.491 | 149.586 | 149.191 | 0.000 | 149.191 | 152.459 | 156.495 | 159.999 | 163.659 | Continuing | Continuing |
| 664127: <i>Acq Workforce - Direct</i> | - | 138.491 | 149.586 | 149.191 | 0.000 | 149.191 | 152.459 | 156.495 | 159.999 | 163.659 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

This program element is one of eight direct funded AFLCMC acquisition workforce program elements. The other seven acquisition workforce civilian pay program elements are 0605826F Global Power, 0605827 Global Vigilance and Combat Systems, 0605829F Global Cyber, Network, and Business Systems, 0605830F Global Battle Management, 0605831F Capability Integration, 0605832F Advanced Program Technology, and 0605898F Management Headquarters.

The Air Force Life Cycle Management Center (AFLCMC) equips U.S. and allied forces with operational weapon systems in support of military and national security operations. The acquisition and product support workforce provides cutting edge weapon systems, sustainment capabilities, and is charged with providing management, tools, and technical and business capabilities needed to oversee acquisition programs throughout their life cycle. The direct funded acquisition workforce funded in this program element will support all phases of acquisition programs to include material solution analysis, technology development, engineering and manufacturing development, production and deployment, and operations and support. This funding does not include costs for base operating support civilian personnel. These program elements support both civilian pay and non-pay support requirements.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 6, RDT&E Management Support because this budget activity includes research, development, test and evaluation efforts and funds to sustain and/or modernize the installations or operations required for general research, development, test and evaluation.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support | R-1 Program Element (Number/Name) PE 0605828F I Acq Workforce- Global Reach |
|--|---|

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 138.556 | 153.591 | 165.310 | 0.000 | 165.310 |
| Current President's Budget | 138.491 | 149.586 | 149.191 | 0.000 | 149.191 |
| Total Adjustments | -0.065 | -4.005 | -16.119 | 0.000 | -16.119 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | -0.065 | -4.005 | -16.119 | 0.000 | -16.119 |

Change Summary Explanation

The FY20 PB provides 1,178 authorizations. The FY20 budgeted Average Work Year Cost (AWYC) is \$126,563. The \$16.119M FY20 (FY19 PB) to FY20 (FY20 PB) decrease is due to a budgeted Average Work Year Cost (AWYC) decrease (\$16.219M), and a non-civilian pay upward adjustment of \$0.100M. The AWYC decreased \$13.768K per authorization due to the FY19 PB not funding the FY20 authorizations to the estimated AWYC.

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
|---|----------------|----------------|----------------|

| | | | |
|---|---------|---------|---------|
| <p>Title: Acquisition Workforce - Civilian Pay</p> <p>Description: The acquisition and product support workforce provides cutting edge weapon systems, sustainment capabilities, and is charged with providing management, tools, and technical and business capabilities needed to oversee Global Reach acquisition programs throughout their life cycle.</p> <p>FY 2019 Plans: Fund the Global Reach acquisition and product support workforce.</p> <p>FY 2020 Plans: Fund the Global Reach acquisition and product support workforce.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: The \$4.500M FY19 to FY20 decrease is due to an Average Work Year Cost (AWYC) decrease. The FY19 budgeted AWYC was \$130,383. The FY20 budgeted AWYC is \$126,563. Although the budgeted AWYC increased due to OSD inflation rate increases between FY19 and FY20, it was offset by changing demographics within the PEC for a net decrease of \$3.820K per authorization.</p> | 138.491 | 149.586 | 149.091 |
| <p>Title: Acquisition Workforce - Non-Civilian Pay</p> | 0.000 | 0.000 | 0.100 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0605828F / <i>Acq Workforce- Global Reach</i> |
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| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| <p>Description: The acquisition and product support workforce provides cutting edge weapon systems, sustainment capabilities, and is charged with providing management, tools, and technical and business capabilities needed to oversee Global Reach acquisition programs throughout their life cycle.</p> <p>FY 2019 Plans: Fund the Global Reach acquisition and product support workforce.</p> <p>FY 2020 Plans: Fund the Global Reach acquisition and product support workforce.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: The \$0.100M FY20 (FY19 PB) to FY20 (FY20 PB) non-pay increase is due to additional operational support requirements.</p> | | | |
| Accomplishments/Planned Programs Subtotals | 138.491 | 149.586 | 149.191 |

D. Other Program Funding Summary (\$ in Millions)
N/A

Remarks

E. Acquisition Strategy
N/A

F. Performance Metrics
Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0605829F / <i>Acq Workforce- Cyber, Network, & Bus Sys</i> |
|---|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---------------------------------------|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 205.643 | 226.257 | 235.360 | 0.000 | 235.360 | 242.273 | 253.816 | 261.608 | 272.517 | Continuing | Continuing |
| 664127: <i>Acq Workforce - Direct</i> | - | 205.643 | 226.257 | 235.360 | 0.000 | 235.360 | 242.273 | 253.816 | 261.608 | 272.517 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

Operations and Maintenance appropriation to the Research Development Test and Evaluation appropriation. This program element is one of eight direct funded AFLCMC acquisition workforce program elements. The other seven acquisition workforce civilian pay program elements are 0605826F Global Power, 0605827 Global Vigilance and Combat Systems, 0605828F Global Reach, 0605830F Global Battle Management, 0605831F Capability Integration, 0605832F Advanced Program Technology, and 0605898F Management Headquarters.

The Air Force Life Cycle Management Center (AFLCMC) equips U.S. and allied forces with operational weapon systems in support of military and national security operations. The acquisition and product support workforce provides cutting edge weapon systems, sustainment capabilities, and is charged with providing management, tools, and technical and business capabilities needed to oversee acquisition programs throughout their life cycle. The direct funded acquisition workforce funded in this program element will support all phases of acquisition programs to include material solution analysis, technology development, engineering and manufacturing development, production and deployment, and operations and support. This funding does not include costs for base operating support civilian personnel. These program elements support both civilian pay and non-pay support requirements.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 6, RDT&E Management Support because this budget activity includes research, development, test and evaluation efforts and funds to sustain and/or modernize the installations or operations required for general research, development, test and evaluation.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force</i> / BA 6: <i>RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0605829F / <i>Acq Workforce- Cyber, Network, & Bus Sys</i> |
|--|---|

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 221.393 | 232.315 | 235.178 | 0.000 | 235.178 |
| Current President's Budget | 205.643 | 226.257 | 235.360 | 0.000 | 235.360 |
| Total Adjustments | -15.750 | -6.058 | 0.182 | 0.000 | 0.182 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | -15.750 | -6.058 | 0.182 | 0.000 | 0.182 |

Change Summary Explanation

The FY20 PB provides 1,724 authorizations, \$223.708M for civilian pay and \$11.652M for non-pay requirements. The FY20 budgeted Average Work Year Cost (AWYC) is \$129,761. The \$0.182M FY20 (FY19 PB) to FY20 (FY20 PB) increase is due to 16 fewer authorizations (\$2.076M), a budgeted Average Work Year Cost (AWYC) increase (\$2.032M) and increased non-civilian pay funding (\$0.226M) due to inflation. The loss of 16 authorizations in this program element is due to multiple incremental workload transitions within the Center. The budgeted AWYC increased approximately \$1.179K per authorization due to the FY19 PB not funding the FY20 authorizations to the estimated AWYC.

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
|---|----------------|----------------|----------------|

| | | | |
|---|---------|---------|---------|
| <p>Title: Acquisition Workforce - Civilian Pay</p> <p>Description: The acquisition and product support workforce provides cutting edge weapon systems, sustainment capabilities, and is charged with providing management, tools, and technical and business capabilities needed to oversee Cyber, Network, and Business System acquisition programs throughout their life cycle.</p> <p>FY 2019 Plans: Fund the Cyber, Network, and Business Systems acquisition and product support workforce.</p> <p>FY 2020 Plans: Fund the Cyber, Network, and Business Systems acquisition and product support workforce.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p> | 197.746 | 214.831 | 223.708 |
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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0605829F / <i>Acq Workforce- Cyber, Network, & Bus Sys</i> |
|---|---|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| The \$2.819M FY19 to FY20 increase is due to 7 fewer authorizations (\$0.908M) offset by an Average Work Year Cost (AWYC) increase (\$3.727M). The FY19 budgeted AWYC was \$127,599. The FY20 budgeted AWYC is \$129,761. The AWYC increased approximately \$2.162K per authorization primarily due to OSD inflation rate increases between FY19 and FY20. | | | |
| Title: Acquisition Workforce - Non-Civilian Pay | 7.897 | 11.426 | 11.652 |
| Description: The acquisition and product support workforce provides cutting edge weapon systems, sustainment capabilities, and is charged with providing management, tools, and technical and business capabilities needed to oversee Cyber, Network, and Business System acquisition programs throughout their life cycle. | | | |
| FY 2019 Plans: Fund the Cyber, Network, and Business Systems acquisition and product support workforce. | | | |
| FY 2020 Plans: Fund the Cyber, Network, and Business Systems acquisition and product support workforce. | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: There was a slight increase in FY20 non-pay of \$0.226M due to OSD inflation rate increases. | | | |
| Accomplishments/Planned Programs Subtotals | 205.643 | 226.257 | 235.360 |

D. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

E. Acquisition Strategy

N/A

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | | | | | R-1 Program Element (Number/Name) PE 0605830F / <i>Acq Workforce- Global Battle Mgmt</i> | | | | | | | |
|---|--------------------|----------------|----------------|---------------------|--|----------------------|----------------|----------------|----------------|----------------|-------------------------|-------------------|
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| Total Program Element | - | 146.852 | 165.438 | 160.196 | 0.000 | 160.196 | 163.184 | 167.258 | 170.819 | 174.501 | Continuing | Continuing |
| 664127: <i>Acq Workforce - Direct</i> | - | 146.852 | 165.438 | 160.196 | 0.000 | 160.196 | 163.184 | 167.258 | 170.819 | 174.501 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

This program element is one of eight direct funded AFLCMC acquisition workforce program elements. The other seven acquisition workforce civilian pay program elements are 0605826F Global Power, 0605827 Global Vigilance and Combat Systems, 0605828F Global Reach, 0605829F Global Cyber, Network, and Business Systems, 0605831F Capability Integration, 0605832F Advanced Program Technology, and 0605898F Management Headquarters.

The Air Force Life Cycle Management Center (AFLCMC) equips U.S. and allied forces with operational weapon systems in support of military and national security operations. The acquisition and product support workforce provides cutting edge weapon systems, sustainment capabilities, and is charged with providing management, tools, and technical and business capabilities needed to oversee acquisition programs throughout their life cycle. The direct funded acquisition workforce funded in this program element will support all phases of acquisition programs to include material solution analysis, technology development, engineering and manufacturing development, production and deployment, and operations and support. This funding does not include costs for base operating support civilian personnel. These program elements support both civilian pay and non-pay support requirements.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 6, RDT&E Management Support because this budget activity includes research, development, test and evaluation efforts and funds to sustain and/or modernize the installations or operations required for general research, development, test and evaluation.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force</i> / BA 6: <i>RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0605830F / <i>Acq Workforce- Global Battle Mgmt</i> |
|--|--|

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 152.577 | 169.868 | 154.608 | 0.000 | 154.608 |
| Current President's Budget | 146.852 | 165.438 | 160.196 | 0.000 | 160.196 |
| Total Adjustments | -5.725 | -4.430 | 5.588 | 0.000 | 5.588 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | -5.725 | -4.430 | 5.588 | 0.000 | 5.588 |

Change Summary Explanation

The FY20 PB provides 1,231 authorizations and the FY20 budgeted Average Work Year Cost (AWYC) is \$130,054. The \$5.588M FY20 (FY19 PB) to FY20 (FY20 PB) increase is due to 58 additional authorizations (\$7.543M) offset by a budgeted AWYC decrease (\$2.055M), and a non-civilian pay upward adjustment of \$0.100M. The additional 58 authorizations in this this program element are a result of restoring 63 authorizations for the U-2 Program Office and the loss of 5 authorizations due to workload transition within the Center. The budgeted AWYC decreased \$1.669K per authorization due to the FY19 PB not funding the FY20 authorizations to the estimated AWYC.

C. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| Title: Acquisition Workforce - Civilian Pay | 146.852 | 165.438 | 160.096 |
| Description: The acquisition and product support workforce provides cutting edge weapon systems, sustainment capabilities, and is charged with providing management, tools, and technical and business capabilities needed to oversee Global Battle Management acquisition programs throughout their life cycle. | | | |
| FY 2019 Plans: Fund the Global Battle Management acquisition and product support workforce. | | | |
| FY 2020 Plans: Fund the Global Battle Management acquisition and product support workforce. | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: The \$9.772M FY19 to FY20 decrease is due to 7 fewer authorizations (\$0.910M) and an Average Work Year Cost (AWYC) decrease (\$8.862M). The loss of 7 authorizations in this program element is due to workload transition within the Center. The FY19 budgeted AWYC was \$137,253. The FY20 budget AWYC is \$130,054. The budgeted AWYC decreased \$7.199K per | | | |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | | R-1 Program Element (Number/Name) PE 0605830F / <i>Acq Workforce- Global Battle Mgmt</i> | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| authorization in this PEC due to a shift in demographics as more personnel are retiring with this PEC and being replaced with lower grade trainees and new hires. | | | | |
| Title: Acquisition Workforce - Non-Civilian Pay | | 0.000 | 0.000 | 0.100 |
| Description: The acquisition and product support workforce provides cutting edge weapon systems, sustainment capabilities, and is charged with providing management, tools, and technical and business capabilities needed to oversee Global Battle Management acquisition programs throughout their life cycle. | | | | |
| FY 2019 Plans: Fund the Global Battle Management acquisition and product support workforce. | | | | |
| FY 2020 Plans: Fund the Global Battle Management acquisition and product support workforce. | | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: The \$0.100M FY20 (FY19 PB) to FY20 (FY20 PB) non-pay increase is due to additional operational support requirements. | | | | |
| Accomplishments/Planned Programs Subtotals | | 146.852 | 165.438 | 160.196 |
| D. Other Program Funding Summary (\$ in Millions) N/A | | | | |
| Remarks | | | | |
| E. Acquisition Strategy N/A | | | | |
| F. Performance Metrics Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission. | | | | |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0605831F / <i>Acq Workforce- Capability Integration</i> |
|---|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---------------------------------------|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 221.676 | 220.320 | 220.255 | 0.000 | 220.255 | 223.875 | 228.868 | 233.310 | 237.753 | Continuing | Continuing |
| 664127: <i>Acq Workforce - Direct</i> | - | 221.676 | 220.320 | 220.255 | 0.000 | 220.255 | 223.875 | 228.868 | 233.310 | 237.753 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

This program element is one of eight direct funded AFLCMC acquisition workforce program elements. The other seven acquisition workforce civilian pay program elements are 0605826F Global Power, 0605827 Global Vigilance and Combat Systems, 0605828F Global Reach, 0605829F Global Cyber, Network, and Business Systems, 0605830F Global Battle Management, 0605832F Advanced Program Technology, and 0605898F Management Headquarters.

The Air Force Life Cycle Management Center (AFLCMC) equips U.S. and allied forces with operational weapon systems in support of military and national security operations. The acquisition and product support workforce provides cutting edge weapon systems, sustainment capabilities, and is charged with providing management, tools, and technical and business capabilities needed to oversee acquisition programs throughout their life cycle. The direct funded acquisition workforce funded in this program element will support all phases of acquisition programs to include material solution analysis, technology development, engineering and manufacturing development, production and deployment, and operations and support. This funding does not include costs for base operating support civilian personnel. These program elements support both civilian pay and non-pay support requirements.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 6, RDT&E Management Support because this budget activity includes research, development, test and evaluation efforts and funds to sustain and/or modernize the installations or operations required for general research, development, test and evaluation.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force</i> / BA 6: <i>RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0605831F / <i>Acq Workforce- Capability Integration</i> |
|--|--|

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 196.561 | 226.219 | 208.122 | 0.000 | 208.122 |
| Current President's Budget | 221.676 | 220.320 | 220.255 | 0.000 | 220.255 |
| Total Adjustments | 25.115 | -5.899 | 12.133 | 0.000 | 12.133 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | 25.115 | -5.899 | 12.133 | 0.000 | 12.133 |

Change Summary Explanation

The FY20 PB provides 1,438 authorizations and \$202.651M for civilian pay and \$17.604M for non-pay requirements. The FY20 budgeted Average Work Year Cost (AWYC) is \$140,926. The \$12.133M FY20 (FY19 PB) to FY20 (FY20 PB) increase is due to a budgeted AWYC increase (\$19.399M) offset by 54 fewer authorizations (\$7.610M) and increased non-civilian pay funding (\$0.344M) due to inflation. The loss of 54 authorizations in this program element is primarily due to the transition of 50 authorizations to the HQ AFMC civilian pay non-Acquisition Workforce PEC in addition to 4 authorizations realigned due to workload transition within the Center. The budgeted AWYC increased approximately \$13.490K per authorization due to the FY19 PB not funding the FY20 authorizations to the estimated AWYC.

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| <p>Title: Acquisition Workforce - Civilian Pay</p> <p>Description: The acquisition and product support workforce provides cutting edge weapon systems, sustainment capabilities, and is charged with providing management, tools, and technical and business capabilities needed to oversee acquisition programs throughout their life cycle.</p> <p>FY 2019 Plans: Fund the Capability Integration acquisition and product support workforce.</p> <p>FY 2020 Plans: Fund the Capability Integration acquisition and product support workforce.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p> | 204.432 | 202.882 | 202.651 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0605831F / <i>Acq Workforce- Capability Integration</i> |
|---|--|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| The \$6.308M FY19 to FY20 decrease is due to 54 fewer authorizations (\$7.610M) offset by an Average Work Year Cost (AWYC) increase (\$1.302M). The FY19 budgeted AWYC was \$140,020. The FY20 budgeted AWYC is \$140,926. The AWYC increased approximately \$0.905K per authorization primarily due to OSD inflation rate increases between FY19 and FY20. | | | |
| Title: Acquisition Workforce - Non-Civilian Pay | 17.244 | 17.438 | 17.604 |
| Description: The acquisition and product support workforce provides cutting edge weapon systems, sustainment capabilities, and is charged with providing management, tools, and technical and business capabilities needed to oversee acquisition programs throughout their life cycle. | | | |
| FY 2019 Plans: Fund the Capability Integration acquisition and product support workforce. | | | |
| FY 2020 Plans: Fund the Capability Integration acquisition and product support workforce. | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: The FY20 PB provides \$17.604M for non-pay requirements. The increased non-civilian pay funding (\$0.344M) is due to inflation. | | | |
| Accomplishments/Planned Programs Subtotals | 221.676 | 220.320 | 220.255 |

D. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

E. Acquisition Strategy

N/A

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0605832F / <i>Acq Workforce- Advanced Prgm Technology</i> |
|---|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---------------------------------------|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 27.997 | 37.399 | 42.392 | 0.000 | 42.392 | 43.266 | 44.178 | 44.986 | 45.829 | Continuing | Continuing |
| 664127: <i>Acq Workforce - Direct</i> | - | 27.997 | 37.399 | 42.392 | 0.000 | 42.392 | 43.266 | 44.178 | 44.986 | 45.829 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

This program element is one of eight direct funded AFLCMC acquisition workforce program elements. The other seven acquisition workforce civilian pay program elements are 0605826F Global Power, 0605827F Global Vigilance and Combat Systems, 0605828F Global Reach, 0605829F Global Cyber, Network, and Business Systems, 0605830F Global Battle Management, 0605831F Capability Integration, and 0605898F Management Headquarters.

The Air Force Life Cycle Management Center (AFLCMC) equips U.S. and allied forces with operational weapon systems in support of military and national security operations. The acquisition and product support workforce provides cutting edge weapon systems, sustainment capabilities, and is charged with providing management, tools, and technical and business capabilities needed to oversee acquisition programs throughout their life cycle. The direct funded acquisition workforce funded in this program element will support all phases of acquisition programs to include material solution analysis, technology development, engineering and manufacturing development, production and deployment, and operations and support. This funding does not include costs for base operating support civilian personnel. These program elements support both civilian pay and non-pay support requirements.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 6, RDT&E Management Support because this budget activity includes research, development, test and evaluation efforts and funds to sustain and/or modernize the installations or operations required for general research, development, test and evaluation.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force</i> / BA 6: <i>RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0605832F / <i>Acq Workforce- Advanced Prgm Technology</i> |
|--|--|

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 28.322 | 38.400 | 37.697 | 0.000 | 37.697 |
| Current President's Budget | 27.997 | 37.399 | 42.392 | 0.000 | 42.392 |
| Total Adjustments | -0.325 | -1.001 | 4.695 | 0.000 | 4.695 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | -0.325 | -1.001 | 4.695 | 0.000 | 4.695 |

Change Summary Explanation

The FY20 PB provides 286 authorizations and the FY20 budgeted Average Work Year Cost (AWYC) is \$147,874. The \$4.695M FY20 (FY19 PB) to FY20 (FY20 PB) increase is due to 3 additional authorizations (\$0.444M), a budgeted AWYC increase (\$4.151M), and a non-civilian pay upward adjustment of \$0.100M. The additional 3 authorizations in this this program element are due to workload transition within the Center. The budgeted AWYC increased \$14.514K per authorization due to the FY19 PB not funding the FY20 authorizations to the estimated AWYC.

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| Title: Acquisition Workforce - Civilian Pay | 27.997 | 37.399 | 42.292 |
| Description: The acquisition and product support workforce provides cutting edge weapon systems, sustainment capabilities, and is charged with providing management, tools, and technical and business capabilities needed to oversee Advanced Program Technology acquisition programs throughout their life cycle. | | | |
| FY 2019 Plans: Fund the Advanced Program Technology acquisition and product support workforce. | | | |
| FY 2020 Plans: Fund the Advanced Program Technology acquisition and product support workforce. | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: The \$3.892M FY19 to FY20 increase is due to 3 additional authorizations (\$0.444M) and an Average Work Year Cost (AWYC) increase (\$3.448M) due to inflation. The additional 3 authorizations in this program element are due to workload transition | | | |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | | R-1 Program Element (Number/Name) PE 0605832F / <i>Acq Workforce- Advanced Prgm Technology</i> | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| within the Center. The FY19 budgeted AWYC was \$135,818. The FY20 budgeted AWYC is \$147,874. The AWYC increased approximately \$12.056K per authorization primarily due to OSD inflation rate increases between FY19 and FY20. | | | | |
| Title: Acquisition Workforce - Non-Civilian Pay | | 0.000 | 0.000 | 0.100 |
| Description: The acquisition and product support workforce provides cutting edge weapon systems, sustainment capabilities, and is charged with providing management, tools, and technical and business capabilities needed to oversee Advanced Program Technology acquisition programs throughout their life cycle. | | | | |
| FY 2019 Plans: Fund the Advanced Program Technology acquisition and product support workforce. | | | | |
| FY 2020 Plans: Fund the Advanced Program Technology acquisition and product support workforce. | | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: The \$0.100M FY20 (FY19 PB) to FY20 (FY20 PB) non-pay increase is due to additional operational support requirements. | | | | |
| Accomplishments/Planned Programs Subtotals | | 27.997 | 37.399 | 42.392 |
| D. Other Program Funding Summary (\$ in Millions) N/A | | | | |
| Remarks | | | | |
| E. Acquisition Strategy N/A | | | | |
| F. Performance Metrics Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission. | | | | |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force</i> / BA 6: <i>RDT&E Management Support</i> | | | | | R-1 Program Element (Number/Name) PE 0605833F / <i>Acq Workforce- Nuclear Systems</i> | | | | | | | |
|--|--------------------|----------------|----------------|---------------------|---|----------------------|----------------|----------------|----------------|----------------|-------------------------|-------------------|
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| Total Program Element | - | 124.111 | 122.481 | 133.231 | 0.000 | 133.231 | 144.650 | 156.940 | 160.743 | 164.267 | Continuing | Continuing |
| 664127: <i>ACQ Workforce - Direct</i> | - | 124.111 | 122.481 | 133.231 | 0.000 | 133.231 | 144.650 | 156.940 | 160.743 | 164.267 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

This program element directly funds the Air Force Nuclear Weapons Center acquisition workforce.

The AFNWC equips U.S. forces with operational Nuclear Systems weapon systems in support of military and national security operations. The acquisition and product support workforce provides cutting edge weapon systems, sustainment capabilities, and is charged with providing management, tools, and technical and business capabilities needed to oversee Nuclear Systems acquisition programs throughout their life cycle. The direct funded acquisition workforce funded in this program element will support all phases of acquisition programs to include material solution analysis, technology development, engineering and manufacturing development, production and deployment, and operations and support. This funding does not include costs for base operating support civilian personnel. These program elements support both civilian pay and non-pay support requirements.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 6, RDT&E Management Support because this budget activity includes research, development, test and evaluation efforts and funds to sustain and/or modernize the installations or operations required for general research, development, test and evaluation.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 126.611 | 125.761 | 135.548 | 0.000 | 135.548 |
| Current President's Budget | 124.111 | 122.481 | 133.231 | 0.000 | 133.231 |
| Total Adjustments | -2.500 | -3.280 | -2.317 | 0.000 | -2.317 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | -5.500 | -3.280 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 3.000 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | -2.317 | 0.000 | -2.317 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0605833F / <i>Acq Workforce- Nuclear Systems</i> |
|---|---|

Change Summary Explanation

In FY18, \$5.5M was transferred to 0605831F Acq Workforce - Capability Integration. Due to execution constrained, \$3M was reprogrammed in via a BTR from 0605826F Acq Workforce - Global Power.

In FY19, \$3.280M is the Nuclear Systems percentage of a shared Congressional Mark for "unjustified growth" spread across all Acquisition Workforce program elements.

C. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|---------|---------|--------------|-------------|---------------|
| Title: Acquisition Workforce Description: The acquisition and product support workforce provides cutting edge weapon systems, sustainment capabilities, and is charged with providing management, tools, and technical and business capabilities needed to oversee Nuclear Systems acquisition programs throughout their life cycle. FY 2019 Plans: Continue to fund the Nuclear Systems acquisition and product support workforce. Includes civ pay and non-pay. FY 2020 Base Plans: Continue to fund the Nuclear Systems acquisition and product support workforce. Includes civ pay and non-pay. FY 2020 OCO Plans: N/A FY 2019 to FY 2020 Increase/Decrease Statement: Continue to fund the Nuclear Systems acquisition and product support workforce. Includes civ pay and non-pay. | 124.111 | 122.481 | 133.231 | 0.000 | 133.231 |
| Accomplishments/Planned Programs Subtotals | 124.111 | 122.481 | 133.231 | 0.000 | 133.231 |

D. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

E. Acquisition Strategy

N/A

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

Appropriation/Budget Activity

3600: *Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support*

R-1 Program Element (Number/Name)

PE 0605833F / *Acq Workforce- Nuclear Systems*

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0605898F / <i>Management HQ - R&D</i> |
|---|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|--|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 9.394 | 10.364 | 5.590 | 0.000 | 5.590 | 3.604 | 3.779 | 3.999 | 4.149 | Continuing | Continuing |
| 6606TS: <i>Test and Evaluation Support</i> | - | 3.644 | 4.655 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| 664127: <i>ACQ Workforce - Direct</i> | - | 5.750 | 5.709 | 5.590 | 0.000 | 5.590 | 3.604 | 3.779 | 3.999 | 4.149 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

The Management Headquarters program element 0605898F includes management headquarters personnel for Air Force Life Cycle management Center and Air Force Flight Test Center. Air Force Life Cycle Management Center personnel are included in Budget Program Activity Code 664127 and Air Force Flight Test Center personnel are included in Budget Program Activity Code 6606TS.

The Air Force Life Cycle Management Center (AFLCMC) equips U.S. and allied forces with operational weapon systems in support of military and national security operations. The acquisition and product support workforce provides cutting edge weapon systems, sustainment capabilities, and is charged with providing management, tools, and technical and business capabilities needed to oversee acquisition programs throughout their life cycle. The direct funded acquisition workforce funded in this program element will support all phases of acquisition programs to include material solution analysis, technology development, engineering and manufacturing development, production and deployment, and operations and support. This funding does not include costs for base operating support civilian personnel. This program element supports both civilian pay and non-pay support requirements.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 6, RDT&E Management Support because this budget activity includes research, development, test and evaluation efforts and funds to sustain and/or modernize the installations or operations required for general research, development, test and evaluation.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0605898F / <i>Management HQ - R&D</i> |
|---|--|

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 9.154 | 10.642 | 10.427 | 0.000 | 10.427 |
| Current President's Budget | 9.394 | 10.364 | 5.590 | 0.000 | 5.590 |
| Total Adjustments | 0.240 | -0.278 | -4.837 | 0.000 | -4.837 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | 0.240 | -0.278 | -4.837 | 0.000 | -4.837 |

Change Summary Explanation

The \$4.837M FY20 (FY19 PB) to FY20 (FY20 PB) decrease is due to the removal of project 6606TS (\$3.735M). The remaining \$1.102M decrease is within project 664127 which decreased from \$6.692M FY20 (FY19 PB) to \$5.590M FY20 (FY20 PB). The FY20 PB provides 38 authorizations. The FY20 budgeted Average Work Year Cost (AWYC) is \$144,474. The \$1.102M decrease is due to an AWYC decrease of \$1.202M and a non-civilian pay upward adjustment of \$0.100M. The AWYC decreased \$31.632K per authorization due to a shift in demographics as more personnel are retiring within this PEC and being replaced with lower grade trainees and new hires.

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 6 | | | | | R-1 Program Element (Number/Name) PE 0605898F / Management HQ - R&D | | | | Project (Number/Name) 6606TS / Test and Evaluation Support | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 6606TS: <i>Test and Evaluation Support</i> | - | 3.644 | 4.655 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

This program element includes Air Force Flight Test Center management headquarters personnel to lead, guide and direct the operation of the Air Force Test Center (AFTC) test activities which are included in the Department of Defense (DoD) Major Range and Test Facility Base (MRTFB).

Test and Evaluation (T&E) Support funds institutional test infrastructure activities including: Command and supervisory staffs; supply stocks; maintenance, repair, and replacement of worn or obsolete test equipment and facilities; test infrastructure for data collection, transmission, reduction, and analysis; civilian salaries; temporary duty travel; range operations and material support contract costs for hardware and software engineering and maintenance; and minor improvement and modernization projects. It also funds institutional test aircraft depot level maintenance such as: Programmed Depot Maintenance (PDM), the calendar-based cyclic scheduling of aircraft into depots for update/inspection; modifications and any other depot level repairs required by the aircraft System Program Directors (SPD); engine overhauls; depot-provided area assistance; and assorted ground support equipment overhauls.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| Title: Test and Evaluation Support | 3.644 | 4.655 | 0.000 |
| Description: Air Force Flight Test Center management headquarters personnel. | | | |
| FY 2019 Plans: Air Force Flight Test Center management headquarters personnel. | | | |
| FY 2020 Plans: N/A | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: Funding transferred to PE 0606398F starting in FY 2020. | | | |
| Accomplishments/Planned Programs Subtotals | 3.644 | 4.655 | 0.000 |

C. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600 / 6 | R-1 Program Element (Number/Name) PE 0605898F / <i>Management HQ - R&D</i> | Project (Number/Name) 6606TS / <i>Test and Evaluation Support</i> |
|--|--|---|

D. Acquisition Strategy

N/A

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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|---|--------------------|----------------|----------------|---------------------|---|----------------------|----------------|----------------|---|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 6 | | | | | R-1 Program Element (Number/Name) PE 0605898F / Management HQ - R&D | | | | Project (Number/Name) 664127 / ACQ Workforce - Direct | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 664127: ACQ Workforce - Direct | - | 5.750 | 5.709 | 5.590 | 0.000 | 5.590 | 3.604 | 3.779 | 3.999 | 4.149 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

The Management Headquarters program element 0605898F includes management headquarters personnel for Air Force Life Cycle management Center and Air Force Flight Test Center. Air Force Life Cycle Management Center personnel are included in Budget Program Activity Code 664127 and Air Force Fight Test Center personnel are included in Budget Program Activity Code 6606TS.

The Air Force Life Cycle Management Center (AFLCMC) equips U.S. and allied forces with operational weapon systems in support of military and national security operations. The acquisition and product support workforce provides cutting edge weapon systems, sustainment capabilities, and is charged with providing management, tools, and technical and business capabilities needed to oversee acquisition programs throughout their life cycle. The direct funded acquisition workforce funded in this program element will support all phases of acquisition programs to include material solution analysis, technology development, engineering and manufacturing development, production and deployment, and operations and support. This funding does not include costs for base operating support civilian personnel. This program element supports both civilian pay and non-pay support requirements.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| Title: Acquisition Workforce - Civilian Pay | 5.750 | 5.709 | 5.490 |
| Description: Life Cycle Management Center management headquarters personnel. | | | |
| FY 2019 Plans: Life Cycle Management Center management headquarters personnel. | | | |
| FY 2020 Plans: Life Cycle Management Center management headquarters personnel. | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: The \$0.497M FY19 to FY20 decrease is due entirely to an Average Work Year Cost (AWYC) decrease. The FY19 budgeted AWYC was \$157,553. The FY20 budgeted AWYC is \$144,474. Although the budgeted AWYC increased due to OSD inflation rate increases between FY19 and FY20, it was offset by changing demographics within the PEC for a net decrease of \$13.079K per authorization. | | | |
| Title: Acquisition Workforce - Non-Civilian Pay | 0.000 | 0.000 | 0.100 |
| Description: Life Cycle Management Center management headquarters personnel. | | | |
| FY 2019 Plans: | | | |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600 / 6 | R-1 Program Element (Number/Name) PE 0605898F / <i>Management HQ - R&D</i> | Project (Number/Name) 664127 / <i>ACQ Workforce - Direct</i> |
|--|--|--|

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|---------|---------|---------|
| Life Cycle Management Center management headquarters personnel. | | | |
| <i>FY 2020 Plans:</i> Life Cycle Management Center management headquarters personnel. | | | |
| <i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> The \$0.100M FY20 (FY19 PB) to FY20 (FY20 PB) non-pay increase is due to additional operational support requirements. | | | |
| Accomplishments/Planned Programs Subtotals | 5.750 | 5.709 | 5.590 |

C. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0605976F / <i>Facilities Restoration and Modernization - Test and Evaluation Support</i> |
|---|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 135.507 | 187.216 | 88.445 | 0.000 | 88.445 | 69.293 | 70.730 | 72.019 | 73.315 | Continuing | Continuing |
| 6606MC: <i>Facility Restoration and Modernization - T&E</i> | - | 135.507 | 187.216 | 88.445 | 0.000 | 88.445 | 69.293 | 70.730 | 72.019 | 73.315 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

Restoration includes repair and replacement work to restore damaged facilities due to accident or failure attributable to inadequate sustainment, excessive age, or other causes. Modernization includes alteration of facilities to implement a new, higher standard (including regulatory changes), to accommodate new functions, or to replace building components that typically last more than 50 years (such as foundations and structural components). Other tasks associated with facilities operations (such as custodial services, grass cutting, and the provision of central utilities) are not included. These restoration/modernization funds support the following Air Force test organizations and their associated test and evaluation facilities, including: remote locations, the 96th Test Wing (TW) at Eglin AFB, FL, Arnold Engineering and Development Complex (AEDC) at Arnold AFB, TN, including AEDC's 704th Test Group (TG) at Holloman AFB, NM, 704 TG Landing Gear Test Facility (LGTF) at Wright-Patterson AFB, OH, AEDC's Hypersonic Wind Tunnel 9 at White Oak, MD, AEDC's National Full-Scale Aerodynamics Complex (NFAC) at Moffett Field, CA, AEDC's McKinley Climatic Lab (MCL) at Eglin AFB, FL, and the 412th TW at Edwards AFB, CA.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 6, RDT&E Management Support because this budget activity includes research, development, test and evaluation efforts and funds to sustain and/or modernize the installations or operations required for general research, development, test and evaluation.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| | |
|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0605976F / <i>Facilities Restoration and Modernization - Test and Evaluation Support</i> |
|---|---|

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 135.507 | 162.216 | 88.445 | 0.000 | 88.445 |
| Current President's Budget | 135.507 | 187.216 | 88.445 | 0.000 | 88.445 |
| Total Adjustments | 0.000 | 25.000 | 0.000 | 0.000 | 0.000 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 25.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Change Summary Explanation

FY19: The PE received \$25.0 million in congressional add funding that will be used for the McKinley Climatic Lab return to service effort and for the Joint Preflight Integration of Munition and Electronic Systems (JPRIMES)anechoic chamber fire suppression and heating, ventilation, and air conditioning (HVAC) systems.

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| Title: Facility restoration and modernization at the 96 TW | 3.047 | 14.897 | 3.623 |
| Description: Facility restoration and modernization at the 96th TW. | | | |
| FY 2019 Plans: Continue Restoration and Modernization (R&M) efforts across the range complex including HVAC systems, repair/replace lightning protection systems, repair/replace fire protection systems and corrosion control. \$10.7 million of the \$25 million Congressional add will be used to modernize deteriorated fire suppression systems in the 96 TW JPRIMES anechoic test chamber and replace the JPRIMES HVAC system. | | | |
| FY 2020 Plans: Continue Restoration and Modernization (R&M) efforts across the range complex including Heating, Ventilation and Air Conditioning (HVAC) systems, repair/replace lightning protection systems, repair/replace fire protection systems and corrosion control. | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: \$11.3 million decrease from FY19 to FY20 due to one time increase of \$10.7M of \$25.0M FY19 Congressional add funding. | | | |
| Title: Facility restoration and modernization at AEDC | 120.289 | 150.292 | 79.193 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0605976F / <i>Facilities Restoration and Modernization - Test and Evaluation Support</i> |
|---|---|

| | | | |
|---|----------------|----------------|----------------|
| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|

| | | | |
|---|--|--|--|
| <p>Description: Facility restoration and modernization at AEDC.</p> <p>FY 2019 Plans: Continue execution of the three remaining AEDC SLEPS to restore and modernize the PWT, VKF, & ETF infrastructure. Continued design/construction of FY 2018 SLEP efforts using Facilities Acquisitions for Restoration and Modernization (FARM) and other contracts. Continue award of contracts for additional Service Life Extension Projects (SLEPs) Task Orders (TOs) to be executed during FY 2019-2020 facilities outages. Continue modernization of the Landing Gear Test Facility (LGTF) utility room. Replace (three of five) LGTF Test Machine servo valves, accumulators, and hydraulic hoses. Data acquisition improvements to the LGTF 120 MOD dynamometer operator GUI. Replace the third hanger door on the large hanger. Continue refurbishment of National Radar Cross Section (RCS) Test Facility (NRTF) Advanced Measurement Systems (RAMS) Central Measurement System (RCMS). Continue refurbishment of NRTF Calibration Pit. Continue building renovations for Central Inertial and Global Positioning System (GPS) Test Facility (CIGTF) and Holloman High Speed Test Track (HHSTT). Rainfield repairs at HHSTT. Begin HHSTT South 5 thousand foot restoration project. \$13.7 Million of the \$25 Million FY19 Congressional add returns McKinley Climatic Lab to full service with replacement of Air Makeup Unit destroyed in fire, including structural repair. \$0.6 Million of the FY19 add modernizes the Acquisition and Control System for the National Radar Cross Section (RCS) Test Facility Advanced Measurement System. In addition, Mid-Pressure Arc Heater Increment 2 upgrades to support full-scale hypersonic testing will commence.</p> <p>FY 2020 Plans: Continue execution of the three remaining AEDC SLEPS to restore and modernize the PWT, VKF, & ETF infrastructure. Continued design/construction of FY 2019 SLEP efforts using Facilities Acquisitions for Restoration and Modernization (FARM) and other contracts. Continue award of contracts for additional Service Life Extension Projects (SLEPs) Task Orders (TOs) to be executed during FY 2019-2020 facilities outages. Continue modernization of the Landing Gear Test Facility (LGTF) utility room. Replace LGTF Test Machine servo valves, accumulators, and hydraulic hoses. Data acquisition improvements to the LGTF 120 MOD dynamometer operator GUI. Replace door on the large hanger. Continue refurbishment of National Radar Cross Section (RCS) Test Facility (NRTF) Advanced Measurement Systems (RAMS) Central Measurement System (RCMS). Continue refurbishment of NRTF Calibration Pit. Continue building renovations for Central Inertial and Global Positioning System (GPS) Test Facility (CIGTF) and Holloman High Speed Test Track (HHSTT). Rain field repairs at HHSTT. Continue HHSTT South 5 thousand foot restoration project. Additional improvements and upgrades to Electrical, Mechanical and Valve systems in A/B/C Plants.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p> | | | |
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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0605976F / <i>Facilities Restoration and Modernization - Test and Evaluation Support</i> |
|---|---|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| \$71.2 million decrease from FY19 to FY20 due to \$57 million decrease as efforts associated with FY17PB SLEP I modernization near completion and \$14.3 million of FY19 Congressional add funding associated with the McKinley Climatic Lab return to service effort and the RCS Advanced Measurement System modernization effort ends. | | | |
| Title: Facility restoration and modernization at 412 TW Description: Facility restoration and modernization at the 412 TW. FY 2019 Plans: The FY19 plans include: repair Anechoic Chamber 40 Ton Hoist B1030; repair Generator 1020; Office Conversion, Precision Impact Range (PIRA) B9509; replace/upgrade Phase 1 Chamber Deluge System (includes Radar Absorbing Material (RAM) 24"); Chamber Door - Extension of Top Guide Rail; Repair/Replace Water Line B5780 TO B5790; Power Supply for Turntable and Horseshoe Power B1030; Convert Security Roll Up Door to Automatic B144; repair Shielded Door, South East Corner Radio Frequency Chamber, Benfield Anechoic Facility (BAF) 1030; refurbish All B1440 Mission Control Room (MCR) Doors; replace RF Shielded Main Doors 1030 (5 each); Room 204B Video Teleconference (VTC) Door Replacement B1030; Festoon 2 Installation B1030; Shielded 270 Volt Direct Current (VDC) Installation in Data Acquisition Center (DAC) B1030; G-19 Test Equipment Accountability Upgrade Mezzanine B1030; Hydraulic Unit Upgrade B1030. FY 2020 Plans: The FY20 plans include hydraulic Unit Upgrade B1030; Power Supply for System Under Test Power B1030; Bathroom Renovations B1030 (North and South Tower); replace Radio Frequency (RF) Shielded Mandoors B1030; Seismic Upgrade Mission Control Center (MCC) 1440; Repair/Install Anti-terrorism/Force Protection for MCC 1440; Phase 2 Chamber Deluge System Replacement/Upgrade (includes RAM 24"). FY 2019 to FY 2020 Increase/Decrease Statement: \$16.4 million decrease as FY17PB SLEP I modernization effort for the BAF nears completion. Two projects in particular associated with the FY17PB modernization are the Phase 1 Chamber Deluge System Replacement/Upgrade and the Overhead Hoist project. | 12.171 | 22.027 | 5.629 |
| Accomplishments/Planned Programs Subtotals | 135.507 | 187.216 | 88.445 |

| D. Other Program Funding Summary (\$ in Millions) | | | | | | | | | | | |
|---|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|
| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> <u>Base</u> | <u>FY 2020</u> <u>OCO</u> | <u>FY 2020</u> <u>Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To</u> <u>Complete</u> | <u>Total Cost</u> |
| • RDTE 06 PE 0604256F: <i>Threat Simulator Development</i> | 34.777 | 34.206 | 59.963 | - | 59.963 | 63.925 | 44.844 | 36.577 | 31.717 | Continuing | Continuing |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0605976F / <i>Facilities Restoration and Modernization - Test and Evaluation Support</i> |
|---|---|

D. Other Program Funding Summary (\$ in Millions)

| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> <u>Base</u> | <u>FY 2020</u> <u>OCO</u> | <u>FY 2020</u> <u>Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To</u> <u>Complete</u> | <u>Total Cost</u> |
|--|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|
| • RDTE 06 PE 0604759F: <i>Major T&E Investment</i> | 111.138 | 216.844 | 181.663 | - | 181.663 | 164.005 | 142.090 | 81.386 | 81.843 | Continuing | Continuing |
| • RDTE 06 PE 0605807F: <i>Test and Evaluation Support</i> | 735.688 | 692.784 | 717.895 | - | 717.895 | 721.615 | 761.252 | 765.736 | 779.877 | Continuing | Continuing |
| • RDTE 06 PE 0605978F: <i>Facility Sustainment - T&E Support</i> | 28.720 | 28.888 | 29.424 | - | 29.424 | 29.935 | 30.555 | 31.112 | 31.673 | Continuing | Continuing |

Remarks

E. Acquisition Strategy

N/A.

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force</i> / BA 6: <i>RDT&E Management Support</i> | | | | | R-1 Program Element (Number/Name) PE 0605978F / <i>Facilities Sustainment - Test and Evaluation Support</i> | | | | | | | |
|--|--------------------|----------------|----------------|---------------------|---|----------------------|----------------|----------------|----------------|----------------|-------------------------|-------------------|
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| Total Program Element | - | 28.720 | 28.888 | 29.424 | 0.000 | 29.424 | 29.935 | 30.555 | 31.112 | 31.673 | Continuing | Continuing |
| 6606MR: <i>Facility Sustainment-T&E Support</i> | - | 28.720 | 28.888 | 29.424 | 0.000 | 29.424 | 29.935 | 30.555 | 31.112 | 31.673 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

Provides resources for sustainment activities required for an inventory of Air Force Material Command (AFMC) Test and Evaluation (T&E) facilities. Facility sustainment includes regularly scheduled adjustments and inspections, preventative maintenance tasks, and emergency response and service calls for minor repairs. It also includes major repairs or replacement of facility components that are expected to occur periodically. In addition to standard facility sustainment, such as roof replacement, refinishing of wall and floor surfaces, and repairing and replacing of heating and cooling systems, this work includes inspections and repairs of heavy plant machinery in large industrial facilities. This work includes, but is not limited to, inspection and repair of high-power electrical switching gear, hydraulic, lubrication, forced-air and fluid cooling systems, high pressure vessel health monitoring, facility control and remote monitoring systems, liquid oxygen systems, steam systems, test instrumentation, and fire detection and suppression systems. Other tasks associated with facilities operations (such as custodial services, grass cutting, and landscaping, waste disposal, and the provision of central utilities) are not included. These sustainment funds support the following Air Force organizations and their associated test and evaluation facilities, including: remote locations, the 96th Test Wing (TW) at Eglin AFB, FL, Arnold Engineering and Development Complex (AEDC) at Arnold AFB, TN, AEDC's 704th Test Group (TG) at Holloman AFB, NM, AEDC's 704 TG Landing Gear Test Facility (LGTf) at Wright-Patterson AFB, OH, AEDC's Hypersonic Wind Tunnel 9 at White Oak, MD, AEDC's National Full-Scale Aerodynamics Complex (NFAC) at Moffett Field, CA, AEDC's McKinley Climatic Laboratory (MCL) at Eglin AFB, FL and the 412 Test Wing (TW) at Edwards AFB, CA.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 6, RDT&E Management Support because this budget activity includes research, development, test and evaluation efforts and funds to sustain and/or modernize the installations or operations required for general research, development, test and evaluation.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support | R-1 Program Element (Number/Name) PE 0605978F I Facilities Sustainment - Test and Evaluation Support |
|--|--|

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 28.720 | 28.888 | 29.424 | 0.000 | 29.424 |
| Current President's Budget | 28.720 | 28.888 | 29.424 | 0.000 | 29.424 |
| Total Adjustments | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| <p>Title: Facility sustainment at the 96 TW.</p> <p>Description: Facility sustainment at the 96 TW.</p> <p>FY 2019 Plans: Continue to work through several hundred Direct Scheduled Work Orders (DSWs) within the test infrastructure.</p> <p>FY 2020 Plans: Continue to work through several hundred Direct Scheduled Work Orders (DSWs) within the test infrastructure.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Not applicable.</p> | 0.791 | 0.811 | 0.983 |
| <p>Title: Facility sustainment at the AEDC.</p> <p>Description: Facility sustainment at the AEDC.</p> <p>FY 2019 Plans: Continue to perform calendar based scheduled preventative maintenance on Engine Test Facility Plant and associated engine test cells, Propulsion Wind Tunnel Plant and associated wind tunnels, Von Karman Facility (VKF) Plant Core and associated test cells, arc heaters, rocket test facility, space chambers, and hypersonic engine test facilities, along with associated infrastructure that supports all test operations. Sustainment project includes painting buildings, carpet replacement, heating, ventilation, air conditioning (HVAC) repairs and roof repairs throughout the 704 TG.</p> <p>FY 2020 Plans:</p> | 25.513 | 25.650 | 25.782 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0605978F / <i>Facilities Sustainment - Test and Evaluation Support</i> |
|---|---|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| Continue to perform calendar based scheduled preventative maintenance on Engine Test Facility Plant and associated engine test cells, Propulsion Wind Tunnel Plant and associated wind tunnels, Von Karman Facility (VKF) Plant Core and associated test cells, arc heaters, rocket test facility, space chambers, and hypersonic engine test facilities, along with associated infrastructure that supports all test operations. Sustainment project includes painting buildings, carpet replacement, heating, ventilation, air conditioning (HVAC) repairs and roof repairs throughout the 704 TG. FY 2019 to FY 2020 Increase/Decrease Statement: Not applicable. | | | |
| Title: Facility sustainment at the 412 TW. Description: Facility sustainment at the 412 TW. FY 2019 Plans: Continue sustainment of test unique infrastructure in 412 TW Electronic Warfare, Range, and other T&E facilities located at Edwards AFB, CA. FY 2020 Plans: Continue sustainment of test unique infrastructure in 412 TW Electronic Warfare, Range, and other T&E facilities located at Edwards AFB, CA. FY 2019 to FY 2020 Increase/Decrease Statement: Not applicable. | 2.416 | 2.427 | 2.659 |
| Accomplishments/Planned Programs Subtotals | 28.720 | 28.888 | 29.424 |

| D. Other Program Funding Summary (\$ in Millions) | | | | | | | | | | | |
|--|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|
| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> <u>Base</u> | <u>FY 2020</u> <u>OCO</u> | <u>FY 2020</u> <u>Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To</u> <u>Complete</u> | <u>Total Cost</u> |
| • RDTE 06 PE 0604256F: <i>Threat Simulator Development</i> | 34.777 | 34.206 | 59.693 | - | 59.693 | 63.925 | 44.844 | 36.577 | 31.717 | Continuing | Continuing |
| • RDTE 06 PE 0604759F: <i>Major T&E Investment</i> | 111.138 | 216.844 | 181.663 | - | 181.663 | 164.005 | 142.090 | 81.386 | 81.843 | Continuing | Continuing |
| • RDTE 06 PE 0605807F: <i>Test & Evaluation Support</i> | 735.688 | 692.784 | 717.895 | - | 717.895 | 721.615 | 761.252 | 765.736 | 779.877 | Continuing | Continuing |
| • RDTE 06 PE 0605976F: <i>Facility Restoration and Modernization-T&E</i> | 135.507 | 187.216 | 88.445 | - | 88.445 | 69.293 | 70.730 | 72.019 | 73.315 | Continuing | Continuing |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0605978F / <i>Facilities Sustainment - Test and Evaluation Support</i> |
|---|---|

D. Other Program Funding Summary (\$ in Millions)

| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> <u>Base</u> | <u>FY 2020</u> <u>OCO</u> | <u>FY 2020</u> <u>Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To</u> <u>Complete</u> | <u>Total Cost</u> |
|------------------|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|
|------------------|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|

Remarks

E. Acquisition Strategy

N/A

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0606017F / <i>Requirements Analysis and Maturation</i> |
|---|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 106.646 | 48.070 | 62.715 | 0.000 | 62.715 | 67.731 | 62.234 | 55.023 | 44.705 | Continuing | Continuing |
| 666157: <i>Development Planning</i> | - | 47.383 | 25.007 | 15.533 | 0.000 | 15.533 | 15.830 | 16.159 | 16.461 | 16.768 | Continuing | Continuing |
| 666158: <i>INTEGRATED SIMULATION AND ANALYSIS</i> | - | 59.263 | 23.063 | 47.182 | 0.000 | 47.182 | 51.901 | 46.075 | 38.562 | 27.937 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

The Requirements Analysis and Maturation (RAM) program funds development planning (DP) to include early systems engineering and integrated simulation and analysis. These activities include requirements analysis, capability decomposition and trade space characterization, concept development (system of systems, air, space, and cyber) and architecture design and development, cost analysis, modeling and simulation of representative or prototype systems, and analytical tools. Outcomes of these activities are technologically informed requirements, mature concepts that are technically feasible, and areas for science and technology (S&T) investment to reduce technology risks. These activities provide the analytic basis for cost and capability trades driving non-materiel solutions, and/or materiel solutions. Early-phase systems engineering and technical planning activities funded by this program provide the foundation for informed investment decisions leading to successful acquisition programs. Development planning efforts are coordinated with the Air Force Capability Development Council, Air Force Warfighting Integration Capability, and/or SAF/AQ to ensure funding supports the highest Air Force priorities.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver development planning and integrated simulation and analysis capabilities (to include Simulation and Analysis Facility (SIMAF) support and Joint Simulation Environment (JSE) capability). The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, 0605898F, and 0605833F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 6, RDT&E Management Support because this budget activity includes research, development, test and evaluation efforts and funds to sustain and/or modernize the installations or operations required for general research, development, test and evaluation.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0606017F / <i>Requirements Analysis and Maturation</i> |
|---|---|

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 35.453 | 35.285 | 59.433 | 0.000 | 59.433 |
| Current President's Budget | 106.646 | 48.070 | 62.715 | 0.000 | 62.715 |
| Total Adjustments | 71.193 | 12.785 | 3.282 | 0.000 | 3.282 |
| • Congressional General Reductions | -0.135 | -0.215 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 74.000 | 13.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -2.672 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 3.282 | 0.000 | 3.282 |

Congressional Add Details (\$ in Millions, and Includes General Reductions)

Project: 666157: *Development Planning*

Congressional Add: *Program Increase - Air Superiority 2030 Planning for Development*

Congressional Add: *Program Increase - Global Strike Command Analytics*

Congressional Add: *Program Increase - Nuclear Modernization Analytics*

Congressional Add: *Program Increase - Nuclear Deterrence Research*

Congressional Add Subtotals for Project: 666157

Project: 666158: *INTEGRATED SIMULATION AND ANALYSIS*

Congressional Add: *Program Increase - Modeling and Simulation - Joint Simulation Environment*

Congressional Add Subtotals for Project: 666158

Congressional Add Totals for all Projects

| | FY 2018 | FY 2019 |
|--|----------------|----------------|
| | | |
| | 29.440 | 0.000 |
| | 6.800 | 0.000 |
| | 0.000 | 8.000 |
| | 0.000 | 5.000 |
| | 36.240 | 13.000 |
| | | |
| | 35.781 | 0.000 |
| | 35.781 | 0.000 |
| | 72.021 | 13.000 |

Change Summary Explanation

Increase in FY 2020 due to civilian pay repricing adjustment.

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|---|--------------------|----------------|----------------|---------------------|---|----------------------|----------------|----------------|--|----------------------------|-------------------------|-------------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 6 | | | | | R-1 Program Element (Number/Name) PE 0606017F / <i>Requirements Analysis and Maturation</i> | | | | Project (Number/Name) 666157 / <i>Development Planning</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 666157: <i>Development Planning</i> | - | 47.383 | 25.007 | 15.533 | 0.000 | 15.533 | 15.830 | 16.159 | 16.461 | 16.768 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

The Development Planning (DP) project funds activities to analyze Air Force capability needs and requirements to identify potential shortfalls and opportunities; formulate candidate concepts and solution options to address Air Force capability needs and shortfalls; and conduct coordinated analysis and assessment activities to address requirements, technology needs, capability trades, schedule, cost, and pre-systems acquisition planning. Emphasis is placed on activities to inform strategic planning, analyzing multi-domain capabilities that look first at non-materiel solutions before generating materiel needs and requirements.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| <p>Title: Future Capability Analyses</p> <p>Description: Conduct capability analyses by analyzing warfighter capability needs and requirements to identify potential shortfalls and opportunities.</p> <p>In FY 2019 this effort was named Long-Range Capability Analyses.</p> <p>FY 2019 Plans: Identify and assess enduring and future Air Force capability challenges and emerging opportunities that could lead to new warfighting concepts. Develop capability roadmaps, advanced concept studies and analyses, and derive technology needs required to realize future solutions to warfighter capability needs.</p> <p>FY 2020 Plans: Continue to identify and assess enduring and future Air Force capability challenges and opportunities. Continue to develop capability roadmaps, advanced concept studies and analyses, and derive technology needs required to realize future solutions to warfighter capability needs.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 increased compared to FY 2019 by \$0.130 million. Justification for the increase is described in the plans above.</p> | 4.105 | 4.739 | 4.869 |
| <p>Title: Concept Development</p> <p>Description: Conduct concept development activities to inform strategic investment decisions. Formulate and explore multi-domain options (materiel and non-materiel) to better understand operational decision space.</p> <p>FY 2019 Plans:</p> | 4.082 | 4.529 | 4.665 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 6 | R-1 Program Element (Number/Name) PE 0606017F / <i>Requirements Analysis and Maturation</i> | Project (Number/Name) 666157 / <i>Development Planning</i> |

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| <p>Formulate and explore multi-domain options (materiel and non-materiel) to better understand operational decision space with a focus on command, control, communications, and computers.</p> <p>FY 2020 Plans: Continue to formulate and explore multi-domain options (materiel and non-materiel) to better understand operational decision space.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 increased compared to FY 2019 by \$0.136 million. Justification for the increase is described in the plans above.</p> | | | |
| <p>Title: Capability Development Strategies</p> <p>Description: Conduct strategic planning activities that address requirements, schedule, cost, technology, and acquisition strategy.</p> <p>In FY 2019 this effort was named Pre-systems Acquisition Planning.</p> <p>FY 2019 Plans: Perform pre-systems acquisition planning activities, including concept refinement, software engineering support, cost estimates, acquisition courses of action, and acquisition milestone documentation.</p> <p>FY 2020 Plans: Continue to perform pre-systems acquisition planning activities, including concept refinement, cost estimates, acquisition courses of action, and acquisition milestone documentation.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 increased compared to FY 2019 by \$3.260 million. Funding increased due to civilian pay repricing adjustment.</p> | 2.956 | 2.739 | 5.999 |
| Accomplishments/Planned Programs Subtotals | 11.143 | 12.007 | 15.533 |

| | FY 2018 | FY 2019 |
|--|----------------|----------------|
| Congressional Add: Program Increase - Air Superiority 2030 Planning for Development | 29.440 | 0.000 |
| FY 2018 Accomplishments: Conducted Congressionally-directed efforts | | |
| FY 2019 Plans: Not Applicable | | |
| Congressional Add: Program Increase - Global Strike Command Analytics | 6.800 | 0.000 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 6 | R-1 Program Element (Number/Name) PE 0606017F / <i>Requirements Analysis and Maturation</i> | Project (Number/Name) 666157 / <i>Development Planning</i> |

| | FY 2018 | FY 2019 |
|--|---------|---------|
| FY 2018 Accomplishments: Conducted Congressionally-directed efforts | | |
| FY 2019 Plans: Not Applicable | | |
| Congressional Add: Program Increase - Nuclear Modernization Analytics | 0.000 | 8.000 |
| FY 2018 Accomplishments: Not Applicable | | |
| FY 2019 Plans: Conduct Congressionally-directed efforts | | |
| Congressional Add: Program Increase - Nuclear Deterrence Research | 0.000 | 5.000 |
| FY 2018 Accomplishments: Not Applicable | | |
| FY 2019 Plans: Conduct Congressionally-directed efforts | | |
| Congressional Adds Subtotals | 36.240 | 13.000 |

C. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not applicable.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 6 | | | | | R-1 Program Element (Number/Name) PE 0606017F / <i>Requirements Analysis and Maturation</i> | | | | Project (Number/Name) 666158 / <i>INTEGRATED SIMULATION AND ANALYSIS</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 666158: <i>INTEGRATED SIMULATION AND ANALYSIS</i> | - | 59.263 | 23.063 | 47.182 | 0.000 | 47.182 | 51.901 | 46.075 | 38.562 | 27.937 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

The Integrated Simulation and Analysis project provides a collaborative cross-organizational, multi-domain, holistic enterprise system-of-systems perspective in synthetic environments for modeling, simulation, analysis, and experimentation of systems and concepts under assessment while enabling exploration of innovative materiel and non-materiel alternatives. This effort accomplishes system performance representations/models, environments, architectures, and tools that underpin variable fidelity; stand-alone, interactive, and distributed simulations; and virtual prototyping using an adaptive ecosystem comprised of organizations and capabilities aligned with purpose. Integrated Simulation and Analysis combines real-time and constructive simulations, operators-in-the-loop, experimental and operational software and hardware engineered in synthesized environments to conduct rapid air, space, cyber, and multi-domain warfighting capabilities assessments in support of development planning, experimentation, developmental and operational testing, and training requirements.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| Title: Modeling, Simulation, Analysis, and Experimentation Ecosystem | 23.482 | 23.063 | 17.802 |
| Description: Develop cross-domain system-of-systems modeling, simulation, and analysis capabilities to support development planning, capabilities assessment, and acquisition decisions. | | | |
| In FY 2019 this effort was named Integrated Simulation and Analysis. | | | |
| FY 2019 Plans: Reconfigure and mature models and tool sets to provide integrated simulation capabilities with variable levels of fidelity and realistic representation of battlespace environments. Begin to mature capabilities into a high-fidelity, multi-platform, multi-domain, operationally representative virtual environment to supplement open air testing. Begin test, validation/verification of models. Provide a core set of composable models and a common suite of cross-domain, reusable frameworks at the engineering, engagement, mission, and campaign levels that can be used to support robust development planning and experimentation for high-priority capability gaps, needs, and warfighting challenges identified by Air Force leadership. | | | |
| FY 2020 Plans: Continue to reconfigure and mature models and tool sets to provide integrated simulation capabilities with variable levels of fidelity and realistic representation of battlespace environments. Provide a core set of composable models and a common suite of cross-domain, reusable frameworks at the engineering, engagement, mission, and campaign levels that can be used to support robust | | | |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 6 | R-1 Program Element (Number/Name) PE 0606017F / <i>Requirements Analysis and Maturation</i> | Project (Number/Name) 666158 / <i>INTEGRATED SIMULATION AND ANALYSIS</i> | | |
| B. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| development planning and experimentation for high-priority capability gaps, needs, and warfighting challenges identified by Air Force leadership. FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 decreased compared to FY 2019 by \$5.261 million. Funding decreased due to breaking out Joint Simulation Environment and Simulation and Analysis Facility Support into separate efforts for emphasis. | | | | |
| Title: Joint Simulation Environment (JSE) Description: Develops a government-owned and operated modeling and simulation capability that enables multi-platform, multi-domain integration and interoperability. This capability is required to support developmental and operational testing, tactics development, and advanced training for 5th Generation platforms and other future capabilities, critical for force development. FY 2019 Plans: In FY 2019, this work is performed under the Modeling, Simulation, Analysis, and Experimentation Ecosystem effort. FY 2020 Plans: Design, develop, prototype, and integrate critical JSE components to establish a performance baseline encompassing AF requirements linking 4th, 5th, and 6th Generation systems into a robust environment suitable for test, advanced training, and experimentation. FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 increased compared to FY 2019 by \$25.880 million. Funding increased due to realignment of this effort from the Modeling, Simulation, Analysis, and Experimentation Ecosystem effort and increased emphasis in FY 2020 in JSE activities. | | 0.000 | 0.000 | 25.880 |
| Title: Simulation and Analysis Facility Support Description: Develops real-time, high-fidelity, live virtual constructive modeling, simulation, and analysis capability to evaluate network-enabled warfighting capabilities, strategies, concepts of operation, tactics, emerging technologies, and human system interfaces to support and enable acquisition, test, and training. FY 2019 Plans: In FY 2019, this work is performed under the Modeling, Simulation, Analysis, and Experimentation Ecosystem effort. FY 2020 Plans: Develop and update integrated processes, tools, simulation environments, and capabilities to support live virtual constructive modeling, simulation, and analysis with a focus on cross-domain and multi-level security infrastructures as multi-domain | | 0.000 | 0.000 | 3.500 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600 / 6 | R-1 Program Element (Number/Name) PE 0606017F / <i>Requirements Analysis and Maturation</i> | Project (Number/Name) 666158 / <i>INTEGRATED SIMULATION AND ANALYSIS</i> |
|--|---|--|

| B. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|---------|---------|---------|
| operations force multipliers to support analysis, assessment, and experimentation, as well as operational test and training infrastructures. | | | |
| <i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> FY 2020 increased compared to FY 2019 by \$3.500 million. Funding increased due to realignment of this effort from the Modeling, Simulation, Analysis, and Experimentation Ecosystem effort for greater emphasis. | | | |
| Accomplishments/Planned Programs Subtotals | 23.482 | 23.063 | 47.182 |

| | FY 2018 | FY 2019 |
|--|---------|---------|
| <i>Congressional Add:</i> Program Increase - Modeling and Simulation - Joint Simulation Environment | 35.781 | 0.000 |
| <i>FY 2018 Accomplishments:</i> Conducted Congressionally-directed efforts | | |
| <i>FY 2019 Plans:</i> Not Applicable | | |
| Congressional Adds Subtotals | 35.781 | 0.000 |

C. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not applicable.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0606398F / <i>Management HQ - T&E</i> |
|---|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|--|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 0.000 | 0.000 | 5.013 | 0.000 | 5.013 | 5.338 | 5.451 | 5.565 | 5.682 | 0.000 | 27.049 |
| 6606TS: <i>Test and Evaluation Support</i> | - | 0.000 | 0.000 | 5.013 | 0.000 | 5.013 | 5.338 | 5.451 | 5.565 | 5.682 | 0.000 | 27.049 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | - | - |

A. Mission Description and Budget Item Justification

This program element includes Air Force Flight Test Center management headquarters personnel to lead, guide and direct the operation of the Air Force Test Center (AFTC) test activities which are included in the Department of Defense (DoD) Major Range and Test Facility Base (MRTFB).

Test and Evaluation (T&E) Support funds institutional test infrastructure activities including: Command and supervisory staffs; supply stocks; maintenance, repair, and replacement of worn or obsolete test equipment and facilities; test infrastructure for data collection, transmission, reduction, and analysis; civilian salaries; temporary duty travel; range operations and material support contract costs for hardware and software engineering and maintenance; and minor improvement and modernization projects. It also funds institutional test aircraft depot level maintenance such as: Programmed Depot Maintenance (PDM), the calendar-based cyclic scheduling of aircraft into depots for update/inspection; modifications and any other depot level repairs required by the aircraft System Program Directors (SPD); engine overhauls; depotprovided area assistance; and assorted ground support equipment overhauls.

This program was previously in PE 0605898F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 6, RDT&E Management Support because this budget activity includes research, development, test and evaluation efforts and funds to sustain and/or modernize the installations or operations required for general research, development, test and evaluation.

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force</i> / BA 6: <i>RDT&E Management Support</i> | | R-1 Program Element (Number/Name) PE 0606398F / <i>Management HQ - T&E</i> | | | | |
| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | |
| Previous President's Budget | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | |
| Current President's Budget | 0.000 | 0.000 | 5.013 | 0.000 | 5.013 | |
| Total Adjustments | 0.000 | 0.000 | 5.013 | 0.000 | 5.013 | |
| • Congressional General Reductions | 0.000 | 0.000 | | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | | |
| • Congressional Adds | 0.000 | 0.000 | | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | | |
| • Reprogrammings | 0.000 | 0.000 | | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | | |
| • Other Adjustments | 0.000 | 0.000 | 5.013 | 0.000 | 5.013 | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | | | FY 2018 | FY 2019 | FY 2020 |
| Title: Test and Evaluation Support | | | | 0.000 | 0.000 | 5.013 |
| Description: Air Force Flight Test Center management headquarters personnel. | | | | | | |
| FY 2019 Plans: N/A | | | | | | |
| FY 2020 Plans: Air Force Flight Test Center management headquarters personnel. | | | | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: Program transferred from PE 06065898F. | | | | | | |
| Accomplishments/Planned Programs Subtotals | | | | 0.000 | 0.000 | 5.013 |
| D. Other Program Funding Summary (\$ in Millions) N/A | | | | | | |
| Remarks | | | | | | |
| E. Acquisition Strategy N/A | | | | | | |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0606398F / <i>Management HQ - T&E</i> |
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F. Performance Metrics
Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0308602F / <i>ENTEPRISE INFORMATION SERVICES (EIS)</i> |
|---|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|--|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 18.980 | 20.435 | 17.128 | 0.000 | 17.128 | 9.700 | 13.464 | 11.109 | 7.200 | Continuing | Continuing |
| 66ACSI: <i>ACQ and Command Support Integration</i> | - | 18.980 | 20.435 | 17.128 | 0.000 | 17.128 | 9.700 | 13.464 | 11.109 | 7.200 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

Enterprise Information Services (EIS) is a portfolio of integrated programs/technologies/services that enables and sustains Air Force Information Management and Knowledge Operations. EIS provides Air Force personnel access to, and management of, timely, accurate, and trusted mission data, information, and knowledge supporting information/decision superiority. The environment will utilize the services provided by the Common Computing Environment (CCE).

CCE provides standardized platforms, common application support services, data center migration strategy, and security services for hosting AF mission applications. This acquisition is critical for multiple hosting environments leveraging DoD Joint Information Environment (JIE) Core Data Centers (CDC), commercial cloud capabilities and DISA brokered cloud capabilities in compliance with the Air Force Information Technology (AF IT) baselines. This effort also provides technical expertise, programmatic guidance, and policy navigation that supports AF approved application rationalization processes to multiple hosting environments and enterprise IT Lifecycle Capabilities Integration Environment (CIE) testing of CCE services.

The FY2020 funding request was reduced by \$6.991 million to account for the availability of prior year execution balances.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver weapons system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, 0605898F, and 0605833F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 6, RDT&E Management Support because this budget activity includes research, development, test and evaluation efforts and funds to sustain and/or modernize the installations or operations required for general research, development, test and evaluation.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support | R-1 Program Element (Number/Name) PE 0308602F I ENTEPRISE INFORMATION SERVICES (EIS) |
|--|--|

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 29.049 | 20.545 | 24.119 | 0.000 | 24.119 |
| Current President's Budget | 18.980 | 20.435 | 17.128 | 0.000 | 17.128 |
| Total Adjustments | -10.069 | -0.110 | -6.991 | 0.000 | -6.991 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | -10.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | -0.069 | -0.110 | -6.991 | 0.000 | -6.991 |

Change Summary Explanation

The FY2020 funding request was reduced by \$6.991 million to account for the availability of prior year execution balances.

The FY2018 funding request was reduced \$10.000M by Congress for an unjustified new start.

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| Title: Platform Provisioning | 0.526 | 0.285 | 0.285 |
| Description: This task provides the engineering analysis of the Target Baseline platform configurations leading to development of design patterns and templates to be used at the enterprise level by Air Force Information Technology capabilities. These standards will be developed against multiple hosting environments to include DISA MilCloud, commercial cloud, and Installation Processing Nodes. | | | |
| FY 2019 Plans: - Continue development of CCE platforms and services, compliance across environments and engineering analysis | | | |
| FY 2020 Plans: - Will continue development of CCE platforms and services, compliance across environments and engineering analysis | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: Funding remains constant from FY 2019 to FY 2020 to continue development of CCE platforms and services, compliance across environments and engineering analysis | | | |
| Title: Managed Service Office (MSO) | 2.419 | 0.135 | 0.158 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | | R-1 Program Element (Number/Name) PE 0308602F / <i>ENTEPRISE INFORMATION SERVICES (EIS)</i> | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| <p>Description: This task develops the process flows for engaging mission application program offices, gathering infrastructure requirements and performing engineering analysis to determine optimum hosting platforms for Air Force IT capabilities. This provides the foundation for initial capabilities supporting the JIE stand-up.</p> <p>FY 2019 Plans: - Continue engineering analysis efforts to support application compliance with FDCCI mandates</p> <p>FY 2020 Plans: - Will continue engineering analysis efforts to support application compliance with FDCCI mandates</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding increases from FY 2019 to FY 2020 to account for increase in application migrations</p> | | | | |
| <p>Title: Enterprise Services Extended to the Commercial Cloud</p> <p>Description: This effort develops the design patterns and templates for taking the standardized platforms and enterprise application support services to commercial cloud environments. As more commercial cloud environments receive certifications for hosting DoD applications, this ensures the proper tools are developed and integrated for use in the commercial cloud environments.</p> <p>FY 2019 Plans: - Continue to provide application engineering analyses, engagement process and develop automated platform tools</p> <p>FY 2020 Plans: - Will continue to provide application engineering analyses, engagement process and develop automated platform tools</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding increases from FY 2019 to FY 2020 to account for increased focus on automated platform tools</p> | | 0.500 | 0.420 | 0.571 |
| <p>Title: Common Tool Development</p> <p>Description: Develop and deploy a common set of enterprise tools to support application development and testing. These tools allow the Common Computing Environment to provide Test as a Service to mission application development teams; allowing for standardize development and test environments.</p> <p>FY 2019 Plans: - Continue engineering and analysis activities to develop and incorporate common test processes</p> <p>FY 2020 Plans:</p> | | 0.404 | 0.160 | 0.160 |

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0308602F / <i>ENTEPRISE INFORMATION SERVICES (EIS)</i> |
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| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| <p>- Will continue engineering and analysis activities to develop and incorporate common test processes</p> <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> Funding remains constant from FY 2019 to FY 2020 to continue engineering and analysis activities to develop and incorporate common test processes</p> | | | |
| <p><i>Title:</i> Enterprise Resource Planning Consolidation</p> <p><i>Description:</i> Design, develop and deliver consolidated common services for Enterprise Resource Planning applications. Target environments are development, test, production and disaster recovery across at least two geographically separated locations. This effort includes completing cybersecurity requirements and acquisition of supporting hardware, software and management resources.</p> <p><i>FY 2019 Plans:</i></p> <ul style="list-style-type: none"> - Continue to provide development, test, production and disaster recovery environments - Continue cybersecurity requirements and independent testing of services to be deployment for development/test environments and continue production/disaster recovery environments - Continue to lease supporting hardware and software - Continue the transition of licensing from applications to common service provider <p><i>FY 2020 Plans:</i></p> <ul style="list-style-type: none"> - Will complete and deploy development, test, production and disaster recovery environments - Will continue cybersecurity requirements and independent testing of services to be deployment for development/test environments and continue production/disaster recovery environments - Will lease supporting hardware and software - Will continue the transition of licensing from applications to common service provider <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> Funding decreases from FY 2019 to FY20 because the ERP development program will begin transitioning some common services to sustainment in late FY19 which decreases the development requirement in FY20.</p> | 15.131 | 19.435 | 15.954 |
| Accomplishments/Planned Programs Subtotals | 18.980 | 20.435 | 17.128 |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0308602F / <i>ENTEPRISE INFORMATION SERVICES (EIS)</i> |
|---|---|

D. Other Program Funding Summary (\$ in Millions)

| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> <u>Base</u> | <u>FY 2020</u> <u>OCO</u> | <u>FY 2020</u> <u>Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To</u> <u>Complete</u> | <u>Total Cost</u> |
|---|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|
| • RDTE 06 0308602F: <i>ENTEPRISE INFORMATION SERVICES (EIS)</i> | - | 0.000 | - | - | - | - | - | - | - | Continuing | Continuing |

Remarks

E. Acquisition Strategy

N/A

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0702806F / <i>Acquisition and Management Support</i> |
|---|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|--|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 14.706 | 12.367 | 5.913 | 0.000 | 5.913 | 13.883 | 18.428 | 17.225 | 17.864 | 0.000 | 100.386 |
| 66ACSI: <i>ACQ and Command Support Integration</i> | - | 14.706 | 12.367 | 5.913 | 0.000 | 5.913 | 13.883 | 18.428 | 17.225 | 17.864 | 0.000 | 100.386 |

Note

In FY18, PE 0702806F, Project 66ACSI, Civilian Pay, was transferred to PE 0605829F Acquisition Workforce - Cyber, Network, and Business Systems.

A. Mission Description and Budget Item Justification

The program funds efforts to meet the Defense Acquisition Workforce Improvement Act (DAWIA), as well as Congressional, SECDEF, and SECAF mandates to provide program management execution tools, systems integration and architectural analysis, information technology infrastructure development, and technical workforce management. Funding also provides the framework for Air Force business and acquisition transformation in developing capabilities-based architectures, re-engineering and enabling technologies, integrating robust systems engineering into early acquisition processes, acquisition process improvement analysis, and developing and managing a technical workforce with the expertise to uniformly implement OSD and Air Force engineering guidance and policies. These efforts provide stability in Air Force Acquisition by integrating major processes to reverse trends toward unpredictable program cost, schedule, and performance to facilitate quick response to urgent operational needs from across the entire spectrum of potential conflicts. These integrated capabilities will provide OSD and AF acquisition leadership insights needed to effectively manage a complex portfolio of acquisition programs through more timely and reliable access to authoritative acquisition data.

The FY2020 funding request was reduced by \$12.387 million to account for the availability of prior year execution balances.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 6, RDT&E Management Support because this budget activity includes research, development, test and evaluation efforts and funds to sustain and/or modernize the installations or operations required for general research, development, test and evaluation.

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0702806F / <i>Acquisition and Management Support</i> |
|---|---|

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 14.980 | 12.367 | 18.300 | 0.000 | 18.300 |
| Current President's Budget | 14.706 | 12.367 | 5.913 | 0.000 | 5.913 |
| Total Adjustments | -0.274 | 0.000 | -12.387 | 0.000 | -12.387 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -0.274 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | -12.387 | 0.000 | -12.387 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | | | | | | | | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 6 | | | | | R-1 Program Element (Number/Name) PE 0702806F / <i>Acquisition and Management Support</i> | | | | Project (Number/Name) 66ACSI / <i>ACQ and Command Support Integration</i> | | | |
| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
| 66ACSI: <i>ACQ and Command Support Integration</i> | - | 14.706 | 12.367 | 5.913 | 0.000 | 5.913 | 13.883 | 18.428 | 17.225 | 17.864 | 0.000 | 100.386 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

Note

In FY18, Project 66ACSI, Civilian Pay, was transferred to PE 0605829F Acquisition Workforce - Cyber, Network, and Business Systems.

A. Mission Description and Budget Item Justification

The program funds efforts to meet the Defense Acquisition Workforce Improvement Act (DAWIA), as well as Congressional, SECDEF, and SECAF mandates to provide program management execution tools, systems integration and architectural analysis, information technology infrastructure development, and technical workforce management. Funding also provides the framework for Air Force business and acquisition transformation in developing capabilities-based architectures, re-engineering and enabling technologies, integrating robust systems engineering into early acquisition processes, acquisition process improvement analysis, and developing and managing a technical workforce with the expertise to uniformly implement OSD and Air Force engineering guidance and policies. These efforts provide stability in Air Force Acquisition by integrating major processes to reverse trends toward unpredictable program cost, schedule, and performance to facilitate quick response to urgent operational needs from across the entire spectrum of potential conflicts. These integrated capabilities will provide OSD and AF acquisition leadership insights needed to effectively manage a complex portfolio of acquisition programs through more timely and reliable access to authoritative acquisition data.

B. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| Title: Acquisition Mandates | 1.526 | 0.534 | 0.649 |
| Description: Supporting Congressional, SECDEF, and SECAF mandates. Program funding provides the framework for Air Force business and acquisition. | | | |
| FY 2019 Plans: Continue program management and resources management oversight. | | | |
| FY 2020 Plans: Continue program management and resources management oversight. | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: Funding decreased to support other higher priority requirements. | | | |
| Title: Performance Measurements | 1.937 | 0.533 | 0.000 |
| Description: Develops and upgrades performance measures for capability-based planning constructs. | | | |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 6 | R-1 Program Element (Number/Name) PE 0702806F / <i>Acquisition and Management Support</i> | Project (Number/Name) 66ACSI / <i>ACQ and Command Support Integration</i> | | |
| B. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| <p>FY 2019 Plans: Continue to develop and analyze acquisition processes to provide process improvement and efficiencies.</p> <p>FY 2020 Plans: Continue to develop and analyze acquisition processes to provide process improvement and efficiencies.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding decreased to support other higher priority requirements.</p> | | | | |
| <p>Title: Technical and Analytical Support</p> <p>Description: Supports Acquisition Domain-level effort to integrate existing acquisition business systems/services, data, and processes supporting key Acquisition capabilities at the enterprise level (via the Acquisition Domain Capabilities Integration (ADCI) activities). This support entails analysis required to architect an integrated environment on multiple hosting platforms to support the portfolio of acquisition business systems by solving problems across/outside of individual system boundaries with the goal of reducing redundancy, improving systems operations, and improving management of data resulting in dramatically improved transparency, efficiency, and effective management of the Acquisition process. This support also helps implement standards for data management and service-oriented design methodology to facilitate efficiency and interoperability as well as providing some business intelligence services. The creation and support of domain-level requirements and governance processes as well as the creation of domain-wide data standards are additional support items provided.</p> <p>FY 2019 Plans: Continuation of work supporting the automation of key Life Cycle Management Center (LCMC) and Space & Missile Systems Center (SMC) acquisition processes. Continuation of work supporting the onboarding of new capabilities across the Acquisition Domain.</p> <p>FY 2020 Plans: Continuation of work supporting the automation of key Life Cycle Management Center (LCMC) and Space & Missile Systems Center (SMC) acquisition processes. Continuation of work supporting the onboarding of new capabilities across the Acquisition Domain.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding decreased to support other higher priority requirements.</p> | | 3.133 | 1.918 | 0.100 |
| <p>Title: Associated Tool Development</p> | | 3.805 | 4.319 | 0.695 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 6 | R-1 Program Element (Number/Name) PE 0702806F / <i>Acquisition and Management Support</i> | Project (Number/Name) 66ACSI / <i>ACQ and Command Support Integration</i> | | |
| B. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| <p>Description: : Upgrade the enterprise tools that assist PMs and acquisition professionals with the day-to-day program management tasks throughout an Acquisition program's lifecycle. [NOTE: Removed references to "acquisition reporting" as this function lies now primarily with PMRT/CPE.]</p> <p>FY 2019 Plans: Continue expansion of the integrated IT operational environment (Acquisition Application Store) to include additional Acquisition Program Office automation and additional application development. Continue assessment of appropriate tools.</p> <p>FY 2020 Plans: Continue expansion of the integrated IT operational environment (Acquisition Application Store) to include additional Acquisition Program Office automation and additional application development. Continue assessment of appropriate tools.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding decreased to support other higher priority requirements.</p> | | | | |
| <p>Title: Project Management Resource Tools (PMRT)</p> <p>Description: Upgrade enterprise PMRT tools that provide program/project resource management support to the Acquisition community.</p> <p>FY 2019 Plans: Continued enhancement of PMRT to allow increased visibility to acquisition programmatic and financial information for all AF Acquisition Investment programs. Continued expansion of critical PMRT interfaces via the Acquisition Data Service Broker (ADSB). Development of additional PMRT acquisition dashboard data visualizations.</p> <p>FY 2020 Plans: Continued enhancement of PMRT to allow increased visibility to acquisition programmatic and financial information for all AF Acquisition Investment programs. Continued expansion of critical PMRT interfaces via the Acquisition Data Service Broker (ADSB). Development of additional PMRT acquisition dashboard data visualizations.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding decreased to support other higher priority requirements.</p> | | 1.965 | 2.446 | 2.173 |
| <p>Title: Capabilities Integration Environment (CIE)</p> <p>Description: Provides a development, testing and integration environment for Information Technology (IT) system development, prototypes and proofs of concept.</p> | | 1.840 | 2.117 | 2.096 |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600 / 6 | R-1 Program Element (Number/Name) PE 0702806F / <i>Acquisition and Management Support</i> | Project (Number/Name) 66ACSI / <i>ACQ and Command Support Integration</i> | | |
| B. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| <p>FY 2019 Plans: Continues a secure, scalable environment to support Research and Development (R&D), Development Test/Operational Test (DT/OT), integration, exercises, experimentation, acquisition development and direct Warfighter support.</p> <p>FY 2020 Plans: Continues a secure, scalable environment to support Research and Development (R&D), Development Test/Operational Test (DT/OT), integration, exercises, experimentation, acquisition development and direct Warfighter support.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding decreased to support other higher priority requirements.</p> | | | | |
| <p>Title: Development and Retention</p> <p>Description: Supports activities to develop, manage and retain the acquisition workforce.</p> <p>FY 2019 Plans: Performs activities to develop, manage, and retain the acquisition workforce by providing training on enhanced business and engineering processes that enable the effective management of complex acquisition processes, and allows continued interface with the academic community.</p> <p>FY 2020 Plans: Performs activities to develop, manage, and retain the acquisition workforce by providing training on enhanced business and engineering processes that enable the effective management of complex acquisition processes, and allows continued interface with the academic community.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding decreased to support other higher priority requirements.</p> | | 0.500 | 0.500 | 0.200 |
| Accomplishments/Planned Programs Subtotals | | 14.706 | 12.367 | 5.913 |
| C. Other Program Funding Summary (\$ in Millions) | | | | |
| N/A | | | | |
| Remarks | | | | |
| D. Acquisition Strategy | | | | |
| N/A | | | | |

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| Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600 / 6 | R-1 Program Element (Number/Name) PE 0702806F / <i>Acquisition and Management Support</i> | Project (Number/Name) 66ACSI / <i>ACQ and Command Support Integration</i> |

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0804731F / <i>General Skill Training</i> |
|---|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 0.457 | 0.448 | 1.475 | 0.000 | 1.475 | 1.500 | 1.531 | 1.559 | 1.587 | Continuing | Continuing |
| 665297: <i>Technical Training Information Systems</i> | - | 0.457 | 0.448 | 1.475 | 0.000 | 1.475 | 1.500 | 1.531 | 1.559 | 1.587 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

TECHNICAL TRAINING MANAGEMENT SYSTEM (TTMS): TTMS provides AETC organizations with a world class commercial-off-the-shelf (COTS) / government-off-the-shelf (GOTS) learning management system which supports six functions: course design and development; student evaluation; instructor management; student management; data analysis; and resource administration. TTMS is a centralized web-based system which provides productivity enhancements and higher degree of efficiency to AETC. The primary requirement objectives currently under development are: 1) Integration of Basic Training Management System (BTMS) capabilities and student records into the TTMS.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 6, RDT&E Management Support because this budget activity includes research, development, test and evaluation efforts and funds to sustain and/or modernize the installations or operations required for general research, development, test and evaluation.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 1.434 | 1.448 | 1.475 | 0.000 | 1.475 |
| Current President's Budget | 0.457 | 0.448 | 1.475 | 0.000 | 1.475 |
| Total Adjustments | -0.977 | -1.000 | 0.000 | 0.000 | 0.000 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | -0.977 | -1.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 0804731F / <i>General Skill Training</i> |
|---|---|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| <p>Title: Technical Training Management System (TTMS)</p> <p>Description: Provided TTMS productivity enhancements and higher degree of efficiency to AETC (i.e., Military Training Leader and Basic Training Management System).</p> <p>FY 2019 Plans: Will continue to enhance TTMS productivity focusing on Military Training Leader and Basic Training Management Capabilities.</p> <p>FY 2020 Plans: n/A</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: N/A</p> | 0.457 | 0.448 | 1.475 |
| Accomplishments/Planned Programs Subtotals | 0.457 | 0.448 | 1.475 |

D. Other Program Funding Summary (\$ in Millions)
N/A

Remarks

E. Acquisition Strategy
Not applicable

F. Performance Metrics
Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 1001004F / <i>International Activities</i> |
|---|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 4.418 | 3.998 | 4.071 | 0.000 | 4.071 | 4.142 | 4.228 | 4.306 | 4.384 | Continuing | Continuing |
| 664645: <i>International Cooperative Research & Development</i> | - | 4.418 | 3.998 | 4.071 | 0.000 | 4.071 | 4.142 | 4.228 | 4.306 | 4.384 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

The mission of this program is to establish, sustain, expand, and enhance mutually beneficial international partnerships through the implementation of air, space, and cyber international armament cooperation (IAC) agreements thereby supporting USAF and DoD goals and objectives. These International Agreements (IAs) will: significantly improve US and allied conventional defense capacity and capabilities; accelerate the availability of defense systems; realize solutions to meet capability gaps; acquire, upgrade, sustain, and/or support common or interoperable equipment with our allies; create cooperative acquisition, production, or logistic partnerships; promote mutual and equitable sharing of effort, cost, information, and risk; provide operational access; leverage economies of scale; and promote interoperability and commonality with our allies.

The USAF is party to numerous (+500) air, space, and cyber bilateral and multilateral IAs to solve common US and allied military capability gaps, develop materiel solutions, harmonize requirements, and build interoperability with our international partners. This program element funds the USAF to identify, develop, process, negotiate, conclude, implement, and manage IAs in compliance with statutory provisions, legal authorities, fiscal constraints, technology transfer controls, intellectual property rights, third party transfer provisions, equitability criteria, industrial base factors, political-military interests, and the National Defense Strategy (NDS). Included in this budget are: air, space, and cyber IAC IAs activities; technology assessments; specialized working groups; Air Senior National Representative (ASNR) activities; IAC program and project reviews; bilateral and multilateral staff talks; Engineering and Scientist Exchange Program (ESEP); and Administrative and Professional Exchange Program (APEP).

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 6, RDT&E Management Support because this budget activity includes research, development, test and evaluation efforts and funds to sustain and/or modernize the installations or operations required for general research, development, test and evaluation.

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force</i> / BA 6: <i>RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 1001004F / <i>International Activities</i> |
|--|---|

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 4.569 | 3.998 | 4.071 | 0.000 | 4.071 |
| Current President's Budget | 4.418 | 3.998 | 4.071 | 0.000 | 4.071 |
| Total Adjustments | -0.151 | 0.000 | 0.000 | 0.000 | 0.000 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | -0.151 | 0.000 | 0.000 | 0.000 | 0.000 |

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
|---|----------------|----------------|----------------|

| | | | |
|--|-------|-------|-------|
| Title: International Partnership Activities | 2.005 | 1.870 | 1.821 |
| <p>Description: Funds USAF management, support, and oversight of IAC goals and objectives to build global partnerships in support of national security objectives and the National Defense Strategy (NDS). Funds USAF participation in NATO forums to promote harmonization and interoperability. Funds USAF support and participation in OSD bi-lateral IAC forums. Funds SAF/IA Australian liaison office. Funds technical assessments and discussions that support technology development activities and interoperability. Funds USAF efforts to enhance existing relationships with: Australia, Canada, Denmark, France, Germany, Israel, Italy, Japan, NATO, Netherlands, Norway, South Korea, Singapore, Spain, Sweden, and UK. Funds USAF efforts to strengthen/build IAC relationships with: Czech Republic, Hungary, Poland, India, Finland, and Turkey. Funds USAF efforts to establish IAC relationships with: South Africa, Egypt, Brazil, Chile, Taiwan, and other emerging partners IAW the NDS.</p> <p>FY 2019 Plans: Continue ongoing management, support, and oversight of IAC goals and objectives to establish, sustain, expand and enhance mutually beneficial partnerships between the US and coalition partners to meet current and emerging global strategic challenges through optimization of interoperability, integration, and interdependence between coalition forces. Continuing efforts will have an enhanced focus on mutually beneficial partnerships IAW the NDS.</p> <p>FY 2020 Plans: Continue ongoing management, support, and oversight of IAC goals and objectives to establish, sustain, expand and enhance mutually beneficial partnerships between the US and coalition partners to meet current and emerging global strategic challenges</p> | | | |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | | R-1 Program Element (Number/Name) PE 1001004F / <i>International Activities</i> | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| through optimization of interoperability, integration, and interdependence between coalition forces. Continuing efforts will have an enhanced focus on mutually beneficial partnerships IAW the NDS. | | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: Priorities will be adjusted to meet budget allocation. Current activities will be prioritized higher than new efforts to establish beneficial partnerships. | | | | |
| Title: International Armaments Cooperation (IAC) Agreement Activities | | 1.813 | 1.678 | 1.800 |
| Description: Funds the USAF's ability to identify, develop, process, negotiate, conclude, implement, and manage an increasing number of research, development, test, and evaluation (RDT&E) bilateral and multilateral IAC Agreements that meet the goals, objectives, and mission of the USAF and DoD. IAC activities provide access to: critical geography; remote test ranges; challenged environments; operational environments; threat scenarios; new capabilities; world class R&D facilities; personnel; sharing costs; partner critical information systems; and launch vehicles. IAC activities will meet warfighter needs and enhance interoperability by cooperating with our partners in the areas of: secure communications, positioning/navigation, situational awareness, materials and composites, human effectiveness, robotics, nanotechnology, coalition information sharing, biometrics, munitions design, hypersonics, alternative energy, improvised explosive devices (IED) defeat, weapons of mass destruction (WMD) defeat, ground and space based radars, sensors, autonomous control, distributed missions, training systems, lasers, weapon systems, weapon delivery, remotely piloted aircraft, armaments interface, intelligence, surveillance and reconnaissance (ISR), sustainment, gap analysis, simulators, combined logistics, software updates, mission planning systems, world-wide flight requirements, electronic warfare, safety, aging aircraft, airlift, tankers, trainers, system modifications, directed energy, weapon stores, acquisition, development, co-production, interoperability, maintenance, system development, and upgrades. | | | | |
| FY 2019 Plans: Continue to identify, develop, process, negotiate, conclude, implement, and manage the increasing number of RDT&E bilateral and multilateral IAs that meet the goals, objectives, and mission of the USAF and DoD. Negotiations will continue on IAs not concluded during FY18. New IAC agreements and amendments will be initiated IAW the NDS. | | | | |
| FY 2020 Plans: Continue to identify, develop, process, negotiate, conclude, implement, and manage the increasing number of RDT&E bilateral and multilateral IAs that meet the goals, objectives, and mission of the USAF and DoD in the Air Domain. Negotiations will continue on IAs not concluded during FY19. New Air Domain agreements and amendments will be initiated IAW the NDS. | | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: | | | | |

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 1001004F / <i>International Activities</i> |
|---|---|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| Priorities will be adjusted to meet budget allocation. Current agreement activities will be prioritized higher than initiating new IAC efforts to identify, develop, negotiate, and conclude international agreements. | | | |
| Title: Engineer and Scientist Exchange Program/Administrative and Professional Exchange Program (ESEP/APEP) Description: Funds the USAF execution and management oversight of ESEP and APEP programs and personnel. Funds eight to ten field level military and civilian personnel from Air Force Materiel Command Facilities, Product Centers, Test Centers, and Logistic Centers for tours at selected allied partner government laboratories and facilities. FY 2019 Plans: Continue USAF execution and management oversight of the ESEP and APEP programs and personnel. FY 2020 Plans: Continue USAF execution and management oversight of the ESEP and APEP programs and personnel. FY 2019 to FY 2020 Increase/Decrease Statement: The number of USAF ESEP/APEP placements overseas will be adjusted based on funding available. | 0.450 | 0.300 | 0.300 |
| Title: Air Force Materiel Command (AFMC) Description: Funds AFMC's ability to support IAC RDT&E activities which directly promotes international collaboration. Funds field level technical assessments and discussions that support technology identification and initial development activities in support of interoperability. FY 2019 Plans: Continue support of AFMC's ability to identify, assess, continue RDT&E activities from 2018 and pursue new areas of cooperation which support interoperability and relationship building efforts with our international partners. FY 2020 Plans: Continue support of AFMC's ability to identify, assess, continue RDT&E activities from 2019 and pursue new areas of cooperation which support interoperability and relationship building efforts with our international partners. | 0.150 | 0.150 | 0.150 |
| Accomplishments/Planned Programs Subtotals | 4.418 | 3.998 | 4.071 |

| D. Other Program Funding Summary (\$ in Millions) | | | | | | | | | | | |
|--|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|
| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> <u>Base</u> | <u>FY 2020</u> <u>OCO</u> | <u>FY 2020</u> <u>Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To</u> <u>Complete</u> | <u>Total Cost</u> |
| • RDTE 06 1001004F: <i>International Activities</i> | 0.000 | 0.000 | 0.000 | - | 0.000 | - | - | - | - | 0.000 | 0.000 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 1001004F / <i>International Activities</i> |
|---|---|

D. Other Program Funding Summary (\$ in Millions)

| <u>Line Item</u> | <u>FY 2018</u> | <u>FY 2019</u> | <u>FY 2020</u> <u>Base</u> | <u>FY 2020</u> <u>OCO</u> | <u>FY 2020</u> <u>Total</u> | <u>FY 2021</u> | <u>FY 2022</u> | <u>FY 2023</u> | <u>FY 2024</u> | <u>Cost To</u> <u>Complete</u> | <u>Total Cost</u> |
|------------------|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|
|------------------|----------------|----------------|-------------------------------|------------------------------|--------------------------------|----------------|----------------|----------------|----------------|-----------------------------------|-------------------|

Remarks

There is no other program funding for the activities pursued under 1001004F International Activities.

E. Acquisition Strategy

This program element is the only source of USAF funds to identify, develop, process, negotiate, conclude, implement, and manage IAC opportunities to: (a) acquire, develop, upgrade, sustain, and support common or interoperable equipment with our allies; (b) leverage USAF resources through cost sharing and economies of scale with our partners; (c) exploit the best US and allied technologies for equipping coalition forces; and (d) foster interoperability and commonality with our allies. We obtain these benefits only after IAC opportunities are identified, explored, assessed, developed and IAs are negotiated and concluded. This PE provides funds to execute up-front IAC responsibilities, realize cooperative opportunities, assess allied technologies and generate sound, cost-effective cooperative programs between the USAF and our international partners in the areas of Air, Space and Cyberspace. Once IAs are concluded they are transferred to the appropriate technology or system program office and are then funded by the program office.

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 1206116F / <i>Space Test and Training Range Development</i> |
|---|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|--|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 24.886 | 23.157 | 19.942 | 0.000 | 19.942 | 20.288 | 20.709 | 21.086 | 21.465 | Continuing | Continuing |
| 666156: <i>Space Test and Training Range Development</i> | - | 24.886 | 23.157 | 19.942 | 0.000 | 19.942 | 20.288 | 20.709 | 21.086 | 21.465 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

Supports the development of Space Test and Training Range (STTR) capabilities critical for developmental and operational test, training, exercises and tactics development for Space Control systems and Joint National Space Architecture. Includes development, demonstration and delivery of test assets, special test equipment, capabilities and systems required to test, validate, and verify performance of integrated space control systems. Provides a safe, secure, controllable and repeatable environment for the testing and training of Space Control mission systems and operators that is both realistic and relevant. Additionally, this program develops test range assets for both the fixed node Space Range Operation Center (SROC) at Schriever AFB and a deployable capability to support complex Joint and AF exercises. The virtual range as part of the Family of Systems (FoS), called Advanced Threat Simulation Environment (ATSE) virtual range, is being developed to accomplish the STTR mission. ATSE integrates to a Distributed Mission Architecture, tying into cyber, air, and space ranges for increased realism and complexity required to prepare space operators for real-world threats. This technology will allow for the first-ever use of a realistic signal environment to increase the realism and efficiency of space control squadron training. Additionally, the STTR Next Space Orbital Engagement (OE) range risk reduction projects will analyze, prototype, and demonstrate potential range systems that will be used to support the testing and training of new advanced development space systems, space operator orbital engagement maneuvers advanced training, and future exercises. These risk reduction activities will include on-orbit capabilities, ground components, communication between nodes, and other required infrastructure.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) is transforming the organization and implementation of space acquisition to an enterprise approach, maximizing innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose capabilities.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver STTR weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392F and 1206398F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 1206116F / <i>Space Test and Training Range Development</i> |
|---|--|

This program is in Budget Activity 6, RDT&E Management Support because this budget activity includes research, development, test and evaluation efforts and funds to sustain and/or modernize the installations or operations required for general research, development, test and evaluation.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 25.773 | 23.254 | 19.942 | 0.000 | 19.942 |
| Current President's Budget | 24.886 | 23.157 | 19.942 | 0.000 | 19.942 |
| Total Adjustments | -0.887 | -0.097 | 0.000 | 0.000 | 0.000 |
| • Congressional General Reductions | -0.029 | -0.097 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -0.858 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| Title: Range Control | 24.667 | 23.157 | 19.942 |
| Description: Development and acquisition of mobile, transportable, virtual, and fixed range monitoring, emulation, and communications capabilities for the space range. | | | |
| FY 2019 Plans: Continue development and acquisition of mobile, transportable, virtual, and fixed range monitoring, emulation, and communications capabilities for the space range. Integrate STTR into the Air Force Range capabilities. Address Risk Management Framework (RMF) compliance, general obsolescence, outdated servers, database overhaul, Windows 10 migration, further hardening of hard drives, upgrade encryption, and software upgrades. Continue program office support and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc. | | | |
| FY 2020 Plans: Continue development of virtual range integration with cyber and air ranges hosting precision emulators and other environments allowing tactics, techniques, and procedures (TTP) development and operational realistic testing, and enable more realistic exercises combining air, space, and cyber effects. Continue Interim Contractor Support (ICS) of virtual range 1.5. Complete development of last part of the mobile/ transportable range asset, and complete Linux migration. Continue risk reduction/mitigation efforts for Space Orbital Engagement Range Risk Reduction Projects which will analyze, prototype, and demonstrate potential range systems that will be used to support the live and virtual testing of new advanced development space systems, space operator orbital engagement maneuvers (OEM) advanced training, and future SPACE FLAG exercises using live and virtual | | | |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 1206116F / <i>Space Test and Training Range Development</i> |
|---|--|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|---------|---------|---------|
| <p>systems. Continue overhaul of fixed range capabilities, general obsolescence, outdated servers, and software upgrades. Provide significant enhancements to include the future integration into virtual environment. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 decreased compared to FY 2019 by \$3.215M. Justification for this decrease is described in plans above.</p> | | | |
| <p>Title: Bandwidth Support</p> <p>Description: Provides for leased Satellite Communication (SATCOM) bandwidth for STTR operations. Previously provided required space range satellite communications bandwidth for exercises, tests, and training of both offensive and defensive space control systems of the space range. Relevant systems have completed bandwidth testing and thus this is no longer required.</p> <p>FY 2019 Plans: N/A</p> <p>FY 2020 Plans: N/A</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: N/A</p> | 0.219 | 0.000 | 0.000 |
| Accomplishments/Planned Programs Subtotals | 24.886 | 23.157 | 19.942 |

D. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

E. Acquisition Strategy

All contracts funded in this program element will be awarded using competitive procedures to the maximum extent possible.

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 1206392F / <i>Space and Missile Center (SMC) Civilian Workforce</i> |
|---|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---------------------------------|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 175.247 | 169.912 | 167.810 | 0.000 | 167.810 | 170.760 | 174.228 | 177.948 | 182.279 | Continuing | Continuing |
| 664280: <i>SMC Civilian Pay</i> | - | 175.247 | 169.912 | 167.810 | 0.000 | 167.810 | 170.760 | 174.228 | 177.948 | 182.279 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

The Space and Missile Systems Center (SMC) equips US and allied forces with operational space and missile systems, launch systems, and command and control infrastructure in support of global military and national security operations. SMC operates with over 6,300 people and an annual budget exceeding \$6.4B providing joint warfighters navigation, communication, weather, warning, force application, and space control capabilities. In FY12, as an AF pilot initiative, SMC acquisition workforce civilian personnel funding was transferred from O&M to RDT&E, AF funds.

SMC is authorized to employ approximately 1,501 civilian acquisition professionals providing the management, tools, and technical capabilities needed to oversee acquisition programs to include material solution analysis, technology development, engineering and manufacturing development, production and deployment, and operations and support. This funding does not include costs for base operating support civilian personnel supporting the Los Angeles AFB 61 Air Base Group. Funding SMC civilian payroll from the RDT&E appropriation provides program managers the flexibility to hire additional civilian personnel with program dollars versus additional contractors in concert with Air Force initiatives in response to the Defense Acquisition Workforce Improvement Act. This program element supports both civilian pay and non-pay support requirements.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) is transforming the organization and implementation of space acquisition to an enterprise approach, maximizing innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose capabilities.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 6, RDT&E Management Support because this budget activity includes research, development, test and evaluation efforts and funds to sustain and/or modernize the installations or operations required for general research, development, test and evaluation.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 1206392F / <i>Space and Missile Center (SMC) Civilian Workforce</i> |
|---|--|

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 169.887 | 169.912 | 171.736 | 0.000 | 171.736 |
| Current President's Budget | 175.247 | 169.912 | 167.810 | 0.000 | 167.810 |
| Total Adjustments | 5.360 | 0.000 | -3.926 | 0.000 | -3.926 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 5.360 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | -3.926 | 0.000 | -3.926 |

Change Summary Explanation

FY 2018: +\$5.360 reprogramming to cover civilian pay shortfall

FY 2020: +\$4.760M Civ Pay repricing; -\$8.686M transfer of funding/manpower to USSPACECOM

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| <p>Title: SMC Acquisition Workforce</p> <p>Description: Provide professional government civilian acquisition workforce in support of all Space and Missile Systems Center programs. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, prototyping, etc.</p> <p>FY 2019 Plans: Provide professional government civilian acquisition workforce in support of all Space and Missile Systems Center programs.</p> <p>FY 2020 Plans: Provide professional government civilian acquisition workforce in support of all Space and Missile Systems Center programs.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 decreased compared to FY 2019 by \$2.102M. Justification for this decrease is the transfer of positions to USSPACECOM.</p> | 175.247 | 169.912 | 167.810 |
| Accomplishments/Planned Programs Subtotals | 175.247 | 169.912 | 167.810 |

D. Other Program Funding Summary (\$ in Millions)

N/A

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 1206392F / <i>Space and Missile Center (SMC) Civilian Workforce</i> | |
| D. Other Program Funding Summary (\$ in Millions) | | |
| Remarks N/A | | |
| E. Acquisition Strategy N/A | | |
| F. Performance Metrics Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission. | | |

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 1206398F / <i>Space & Missile Systems Center - MHA</i> |
|---|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---------------------------------|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 8.681 | 10.508 | 10.170 | 0.000 | 10.170 | 10.340 | 10.556 | 10.779 | 11.005 | Continuing | Continuing |
| 664280: <i>SMC Civilian Pay</i> | - | 8.681 | 10.508 | 10.170 | 0.000 | 10.170 | 10.340 | 10.556 | 10.779 | 11.005 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

The Space and Missile Systems Center (SMC) equips US and allied forces with operational space and missile systems, launch systems, and command and control infrastructure in support of global military and national security operations. SMC operates with over 6,300 people and an annual budget exceeding \$6.4B providing joint warfighters navigation, communication, weather, warning, force application, and space control capabilities. In FY 2012, as an AF pilot initiative, SMC acquisition workforce civilian personnel funding was transferred from O&M to RDT&E, AF funds.

Program Element 1206398F, Project: 664281 Space and Missile Systems Center - Major Headquarters Activities (MHA) was established to improve overall performance, strengthen business operations, and achieve efficiencies, effectiveness and cost savings that can be transferred to higher priority needs.

Space acquisition must respond with speed and agility to emerging adversary threats. SMC is transforming the organization and implementation of space acquisition to an enterprise approach, maximizing innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose capabilities.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 6, RDT&E Management Support because this budget activity includes research, development, test and evaluation efforts and funds to sustain and/or modernize the installations or operations required for general research, development, test and evaluation.

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| Appropriation/Budget Activity 3600: Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support | R-1 Program Element (Number/Name) PE 1206398F I Space & Missile Systems Center - MHA |
|--|--|

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 9.531 | 10.508 | 9.772 | 0.000 | 9.772 |
| Current President's Budget | 8.681 | 10.508 | 10.170 | 0.000 | 10.170 |
| Total Adjustments | -0.850 | 0.000 | 0.398 | 0.000 | 0.398 |
| • Congressional General Reductions | 0.000 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | -0.850 | 0.000 | | | |
| • SBIR/STTR Transfer | 0.000 | 0.000 | | | |
| • Difference Between the Current PB and the Previous PB | 0.000 | 0.000 | 0.398 | 0.000 | 0.398 |

Change Summary Explanation

FY 2018: -\$0.850M for higher Air Force Space priorities
 FY 2020: \$0.398M increase for civilian pay repricing

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|---|----------------|----------------|----------------|
| Title: SMC - Major Headquarters Activities | 8.681 | 10.508 | 10.170 |
| Description: Provide professional government civilian acquisition workforce in support of all Space and Missile Systems Center Management Headquarters Activities. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to SMC Staff support, studies, technical analysis, prototyping, etc. | | | |
| FY 2019 Plans: Provide professional government civilian acquisition workforce in support of all Space and Missile Systems Center Management Headquarters Activities. | | | |
| FY 2020 Plans: Provide professional government civilian acquisition workforce in support of all Space and Missile Systems Center Management Headquarters Activities. | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 decreased compared to FY 2019 by \$0.338M due to repricing. | | | |
| Accomplishments/Planned Programs Subtotals | 8.681 | 10.508 | 10.170 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 1206398F / <i>Space & Missile Systems Center - MHA</i> | |
| <u>D. Other Program Funding Summary (\$ in Millions)</u> N/A | | |
| <u>Remarks</u> | | |
| <u>E. Acquisition Strategy</u> N/A | | |
| <u>F. Performance Metrics</u> Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission. | | |

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 1206860F / <i>Rocket Systems Launch Program (SPACE)</i> |
|---|--|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|--|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 33.023 | 19.721 | 13.192 | 0.000 | 13.192 | 17.999 | 21.074 | 20.509 | 19.045 | Continuing | Continuing |
| 661023: <i>Rocket System Launch Program (RSLP)</i> | - | 33.023 | 19.721 | 13.192 | 0.000 | 13.192 | 17.999 | 21.074 | 20.509 | 19.045 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

Per FY 2019 National Defense Authorization Act, the Evolved Expendable Launch Vehicle (EELV) program, will be renamed the National Security Space Launch program, effective 1 March 2019.

Rocket Systems Launch Program (RSLP) provides responsive space and Research, Development, Test and Evaluation (RDT&E) launch vehicle support to DoD and other government agencies using commercial launch systems and excess ballistic missile assets. The RSLP mission was established by the Secretary of Defense in 1972. The small launch program complements the National Security Space Launch (NSSL) program with multiple options to acquire dedicated spacelift and rideshare services for developmental, demonstration, and small operational space vehicles. It provides mission planning, payload integration, vehicle acquisition, processing, launch operations, booster storage and disposition, aging surveillance, maintenance and logistics support for selected DoD responsive space and RDT&E launches. Costs directly attributable to a specific launch or program (e.g., reliability of flight testing, maintenance of launch vehicle processing infrastructure) are paid by the user (Air Force, Navy, Army, Missile Defense Agency (MDA), Defense Advanced Research Project Agency (DARPA), National Reconnaissance Office (NRO), etc.). RSLP maintains exclusive control of deactivated Minuteman and Peacekeeper assets used in testing to include refurbishment, transportation and handling, storage, aging surveillance, and launch services. RSLP also funds general research, development, prototyping, integration, and supplemental reliability of flight testing efforts for launch to enhance the reliability of the Minotaur and other fleet vehicles (e.g., updates to the Modular Mechanical Ordnance Destruct System).

The FY2020 funding request was reduced by \$4.5 million to account for the availability of prior year execution balances.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) is transforming the organization and implementation of space acquisition to an enterprise approach, maximizing innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose capabilities.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver Rocket Systems Launch weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392F and 1206398F.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 1206860F / <i>Rocket Systems Launch Program (SPACE)</i> |
|---|--|

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 6, RDT&E Management Support because this budget activity includes research, development, test and evaluation efforts and funds to sustain and/or modernize the installations or operations required for general research, development, test and evaluation.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 20.975 | 19.721 | 17.692 | 0.000 | 17.692 |
| Current President's Budget | 33.023 | 19.721 | 13.192 | 0.000 | 13.192 |
| Total Adjustments | 12.048 | 0.000 | -4.500 | 0.000 | -4.500 |
| • Congressional General Reductions | -0.045 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 13.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -0.907 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | -4.500 | 0.000 | -4.500 |

Congressional Add Details (\$ in Millions, and Includes General Reductions)

Project: 661023: *Rocket System Launch Program (RSLP)*

Congressional Add: *Tiny Launch*

Congressional Add Subtotals for Project: 661023

Congressional Add Totals for all Projects

| | FY 2018 | FY 2019 |
|--|----------------|----------------|
| | 13.000 | - |
| | 13.000 | - |
| | 13.000 | - |

C. Accomplishments/Planned Programs (\$ in Millions)

| | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| Title: Storage/Refurbishment/Demil | 15.208 | 15.773 | 10.844 |
| Description: Storage, refurbishment, inventory control, and demil/disposal of deactivated Minuteman, Peacekeeper and other missile flight test assets | | | |
| FY 2019 Plans: | | | |
| Continuing storage, refurbishment, inventory control, and demil/disposal of deactivated Minuteman, Peacekeeper and other missile flight test assets and performing research and development support operations as required. Investigating and developing | | | |

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|--|--|--|----------------|----------------|
| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | | R-1 Program Element (Number/Name) PE 1206860F / <i>Rocket Systems Launch Program (SPACE)</i> | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| shipping throughput capacity to maximize opportunity for motor disposal. Continuing support activities to include but not limited to sustainment replacement and refurbishment of support equipment, mission support, special studies etc. | | | | |
| FY 2020 Plans: Continue storage, refurbishment, inventory control, and demil/disposal of deactivated Minuteman, Peacekeeper and other missile flight test assets and perform research and development support operations as required. Investigate and develop shipping throughput capacity to maximize opportunity for motor disposal. Continue support activities to include but not limited to sustainment replacement and refurbishment of support equipment, mission support, special studies etc. | | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 decreased compared to FY 2019 by \$4.929M. This reduction reflects a decrease in planned motor disposal, refurbishment, inventory control, and research development for operations. | | | | |
| Title: Aging Surveillance | | 4.215 | 3.048 | 1.948 |
| Description: Perform aging surveillance-related activities on stored motors | | | | |
| FY 2019 Plans: Continuing to perform aging surveillance-related activities on stored motors; continuing to perform analysis and studies to identify and evaluate potential safety-related issues affecting stored motors; continuing program office support and related support activities such as, but not limited to mission support, special studies, etc. | | | | |
| FY 2020 Plans: Continue performing aging surveillance-related activities on stored motors; continue performing analysis/studies to identify and evaluate potential safety-related issues affecting stored motors; continue program office support and related support activities such as, but not limited to mission support, special studies, etc. | | | | |
| FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 decrease compared to FY 2019 by \$1.100M. This reduction reflects a decrease in aging surveillance activities, analysis/studies, and program office support. | | | | |
| Title: Other Launch Support Services | | 0.600 | 0.900 | 0.400 |
| Description: Perform launch services activities | | | | |
| FY 2019 Plans: Continuing launch vehicle acquisition, processing, launch services support, mission assurance, and operations to launch RDT&E payloads. | | | | |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | Date: February 2019 |
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| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 1206860F / <i>Rocket Systems Launch Program (SPACE)</i> |
|---|--|

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|---------|---------|---------|
| <p>Rapidly responding to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, prototyping, etc.</p> <p>FY 2020 Plans: Continue launch vehicle acquisition, processing, launch services support, mission assurance, and operations to launch RDT&E payloads.</p> <p>Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, prototyping, etc.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 decreased compared to FY 2019 by \$0.500M. This reduction reflects reduced scope of launch study/service planned and identified for FY 2020.</p> | | | |
| Accomplishments/Planned Programs Subtotals | 20.023 | 19.721 | 13.192 |

| | FY 2018 | FY 2019 |
|---|---------|---------|
| Congressional Add: Tiny Launch | 13.000 | - |
| FY 2018 Accomplishments: In FY 2018 RSLP provided rapid prototypes and demonstrations of a more agile, responsive logistics and launch model on tiny launch vehicles. Tiny launch service capability ensured demonstration of two payloads (Air Force Research Lab cubesat and multiple Space Test Program cubesats) of less than 400lbs to Lower Earth Orbit (LEO) to meet FY 2019 initial launch capability (ILC). | | |
| Congressional Adds Subtotals | 13.000 | - |

D. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

E. Acquisition Strategy

N/A

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 1206864F / <i>Space Test Program (STP)</i> |
|---|---|

| COST (\$ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|-------------|---------|---------|--------------|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| Total Program Element | - | 29.016 | 25.620 | 26.097 | 0.000 | 26.097 | 26.550 | 27.103 | 27.596 | 28.093 | Continuing | Continuing |
| 662617: <i>Free-Flyer Spacecraft Missions</i> | - | 29.016 | 25.620 | 26.097 | 0.000 | 26.097 | 26.550 | 27.103 | 27.596 | 28.093 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

A. Mission Description and Budget Item Justification

The Space Test Program (STP) conducts space test missions for the purpose of accelerating DoD space technology transformation while lowering developmental risk. The program flies an optimally selected number of DoD-sponsored experiments consistent with Space Experiments Review Board (SERB) priority, opportunity, and funding. STP missions provide a cost-effective way to flight test new militarily relevant space system technologies, concepts, and designs, providing a way to:

- Support the acquisition block development approach
- Demonstrate and develop responsive research and development (R&D) space capabilities
- Provide early operational capabilities to quickly react to new developments
- Perform operational risk reduction through direct flight test of prototype components
- Improve operational design by characterizing the space environment, event, or sensor physics proposed for an operational system/system upgrade
- Develop, integrate, test, and acquire advanced payload support hardware for launch vehicles (LV), commercial launch services, and human-rated spaceflight vehicles

The Deputy Secretary of Defense Space Test Program Management & Funding Policy, issued in July 2002, reaffirmed STP as the primary provider of spaceflight for the DoD space research community. The July 2002 policy statement also reaffirmed STP's role as the single manager for all DoD payloads on the International Space Station (ISS).

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) is transforming the organization and implementation of space acquisition to an enterprise approach, maximizing innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose capabilities.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver STP weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392F and 1206398F.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force **Date:** February 2019

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|---|---|
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 6: RDT&E Management Support</i> | R-1 Program Element (Number/Name) PE 1206864F / <i>Space Test Program (STP)</i> |
|---|---|

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 6, RDT&E Management Support because this budget activity includes research, development, test and evaluation efforts and funds to sustain and/or modernize the installations or operations required for general research, development, test and evaluation.

| B. Program Change Summary (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 25.398 | 25.620 | 26.097 | 0.000 | 26.097 |
| Current President's Budget | 29.016 | 25.620 | 26.097 | 0.000 | 26.097 |
| Total Adjustments | 3.618 | 0.000 | 0.000 | 0.000 | 0.000 |
| • Congressional General Reductions | -0.372 | 0.000 | | | |
| • Congressional Directed Reductions | 0.000 | 0.000 | | | |
| • Congressional Rescissions | 0.000 | 0.000 | | | |
| • Congressional Adds | 0.000 | 0.000 | | | |
| • Congressional Directed Transfers | 0.000 | 0.000 | | | |
| • Reprogrammings | 4.836 | 0.000 | | | |
| • SBIR/STTR Transfer | -0.846 | 0.000 | | | |
| • Other Adjustments | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Change Summary Explanation

FY 2018: \$4.836 million increase for Monolith effort

| C. Accomplishments/Planned Programs (\$ in Millions) | FY 2018 | FY 2019 | FY 2020 |
|--|----------------|----------------|----------------|
| <p>Title: Payload Integration</p> <p>Description: Integrate payloads onto spaceflight missions, including free-flyer payloads, hosted payloads, sounding rockets, experiments on the International Space Station (ISS), and commercial missions. Includes acquisition of associated spacecraft and integration hardware.</p> <p>FY 2019 Plans: Complete development, launch, and deploy Space Test Program Satellite-4 (STPSat-4) from the ISS. Complete payload integration and launch STP-Houston 6 (H6). Continue payload integration efforts and launch-based processing and launch operations for STPSat-6 and other efforts onto spaceflight missions.</p> | 15.589 | 17.319 | 20.175 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force</i> / BA 6: <i>RDT&E Management Support</i> | | R-1 Program Element (Number/Name) PE 1206864F / <i>Space Test Program (STP)</i> | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| <p>Continue rapid response to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, prototyping, etc.</p> <p>FY 2020 Plans: Continue payload integration of STP-H7 and begin acquisition of STP-H9. Complete payload integration efforts and launch-based processing and launch operations for STPSat-6. Begin satellite acquisition and integration of STPSat-7. Continue program office support and other related support activities. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc. Exploring potential international rideshare opportunities and identify pathfinder for international Science & Technology payload rideshare process.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 increase compared to FY 2019 by \$2.856M. Justification for this increase is described in plans above.</p> | | | | |
| <p>Title: Launch Vehicle and Launch Services</p> <p>Description: Purchase launch services, launch vehicles and launch vehicle support for free-flyer payloads, hosted payloads, sounding rockets, experiments on the ISS, and commercial spaceflight missions, and support the spaceflight worthiness and "Do No Harm" certification for Space and Missile Systems Center (SMC) and Air Force Space Command.</p> <p>FY 2019 Plans: Continue purchase of launch services, launch vehicles, and launch vehicle support for free-flyer payloads, hosted payloads, sounding rockets, experiments on the ISS, and commercial spaceflight missions. Complete integration of STPSat-6 to the STP-3 launch vehicle. Begin Monolith launch vehicle preparation, an extension of the Rapid Agile Launch Initiative (RALI). Plan to launch commercial mission from Mid-Atlantic Regional Space Port on Wallops Island, Virginia. Launch additional payloads to the ISS. Continue rapid response to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, prototyping, etc.</p> <p>FY 2020 Plans: Launch STPSat-6 on STP-3 launch vehicle. Continue to support spaceflight worthiness and "Do No Harm" certification.</p> | | 8.875 | 6.156 | 4.528 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force | | Date: February 2019 | | |
| Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force</i> / BA 6: <i>RDT&E Management Support</i> | | R-1 Program Element (Number/Name) PE 1206864F / <i>Space Test Program (STP)</i> | | |
| C. Accomplishments/Planned Programs (\$ in Millions) | | FY 2018 | FY 2019 | FY 2020 |
| Continue program office support and other related support activities. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc. FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 decreased compared to FY 2019 by \$1.629M. Justification for this decrease is described in plans above. | | | | |
| Title: On Orbit Satellite Operations Description: Execute first-year operations and operations support for STP-sponsored missions. FY 2019 Plans: Complete first year operations for STPSat-5, Evolved Expendable Launch Vehicle (EELV) Secondary Payload Adapter (ESPA)-Augmented Geostationary Laboratory Experiment (EAGLE), and STP-2 payloads, the Demonstration and Science Experiment (DSX) and NASA's Green Propellant Infusion Mission (GPIM). FY 2020 Plans: Begin first year on-orbit operations support for STPSat-6 and the Long Duration Propulsive ESPA-1 (LDPE-1). Complete STP-2 payloads on-orbit support for GPIM and DSX and continue DSX on orbit operations for an additional year to satisfy SERB experiment objectives for DSX Cyber Hardness Augmentation of an On-Orbit Satellite (CHAOS). Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc. FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 decreased compared to FY 2019 by \$0.751M. Justification for this decrease is described in plans above. | | 4.552 | 2.145 | 1.394 |
| Accomplishments/Planned Programs Subtotals | | 29.016 | 25.620 | 26.097 |
| D. Other Program Funding Summary (\$ in Millions) N/A | | | | |
| Remarks | | | | |
| E. Acquisition Strategy N/A | | | | |
| F. Performance Metrics Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission. | | | | |