| Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Air Force | | | | | | | | | | | Date: April 2022 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Appropriation/Budget Activity<br>3620F: *Research, Development, Test & Evaluation, Space Force* / BA 5: *System Development & Demonstration (SDD)* | | | | | R-1 Program Element (Number/Name)<br>PE 1206448SF / *Resilient MW/MT Ground* | | | | | | | |
| **COST ($ in Millions)** | **Prior Years** | **FY 2021** | **FY 2022** | **FY 2023 Base** | **FY 2023 OCO** | **FY 2023 Total** | **FY 2024** | **FY 2025** | **FY 2026** | **FY 2027** | **Cost To Complete** | **Total Cost** |
| Total Program Element | - | 0.000 | 0.000 | 390.596 | 0.000 | 390.596 | 463.489 | 508.074 | 520.542 | 498.552 | Continuing | Continuing |
| 657124: *Resilient MW/MT* | - | 0.000 | 0.000 | 390.596 | 0.000 | 390.596 | 463.489 | 508.074 | 520.542 | 498.552 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**Note**

MW/MT- Ground, BA 5, PE 1206448SF, is a continuation of the following ongoing efforts: 1) Space Development Agency (SDA) BA4, PE 1206410SDA, and 2) MEO Track Custody Demonstration under PE 1206442SF Next Generation Overhead Persistent Infrared (OPIR) Budget Program Accounting Code 657009: Space Modernization Initiative. This project provides the ground architecture for the MW/MT - LEO project, PE 1206446SF and MW/MT - MEO project, PE 1206447SF.

**A. Mission Description and Budget Item Justification**

In 2021, the Space Warfighting Analysis Center (SWAC) conducted its inaugural USSF Force Design with a key focus area in the Missile Warning and Missile Tracking mission area. The goal of the analysis was to produce a highly resilient government reference design that could maintain custody of emergent dimmer and more maneuverable threats through the boost and post-boost phases of flight. The SWAC concluded that a multi-layered approach was required to meet the stringent performance requirements while maximizing total system resilience. Their recommended government reference design included a combined constellation of 135 LEO and 16 MEO satellites working in concert through an integrated ground solution. On 27 Jan 2022, the Space Acquisition Council concluded that the Space Development Agency would develop the LEO layer of the architecture while Space Systems Command would provide the MEO layer in addition to serving as the total system integrator.

The Missile Warning/Missile Tracking (MW/MT) Ground project executes the ground segment for the OPIR architecture transition from a missile warning boost-phase focused constellation to a distributed, multi-orbit constellation to meet the intent of the 2021 Force Design recommendation. This architecture pivot performs both missile warning and missile tracking (post-boost phase) anchored on the Missile Warning and Missile Defense OPIR Enterprise OPIR Capability Development Document (CDD), validated by the Joint Requirements Oversight Council (JROC), JROCM 042-19, dated 8 May 2019. The inclusion of missile tracking ensures the constellation can maintain custody of evolved dim and maneuvering threats through all phases of flight to provide required missile warning attack characterization. This pivot also marks the transition to a more resilient architecture against kinetic and non-kinetic threats. With space assets distributed in multiple orbits, the overall architecture and mission is more resilient in a contested environment. The Missile Warning / Missile Tracking Low Earth Orbit (LEO) and Medium Earth Orbit (MEO) investments evolve the architecture beyond Next-Gen OPIR GEO, Polar and the Space Modernization Initiative demonstrations to an operational system that will perform the full missile warning and missile tracking mission. The Space Force will phase and deploy space assets for this effort in collaboration with capabilities delivered by the Space Development Agency (SDA).

As part of this PE, the Space Force and SDA will collaboratively develop satellite control capabilities and fuse mission data for accurate warning/tracking solutions. Both the Space Force and SDA will leverage existing global OPIR ground infrastructure within their organizations to perform the layer-specific ground functions. SSC will serve as the System of Systems Integrator to implement this combined ground segment, identifying shared investment strategies to maximize affordability, and

presenting a unified, trusted data source that meet stringent accuracy and latency requirements. Overall, the Department of Defense is united to deliver a multi-faceted OPIR architecture that meets warfighter needs for detection, tracking, and reporting on these challenging evolved missile threats.

To support the LEO Space layer specific ground functions, SDA's ground segment provides constellation management, ground-based data processing, dissemination, and management, space-to-ground verification and ground-based interoperability testing, support operations, and other integration activities for the SDA Tranche 1 (T1) Tracking Layer and integrates with the MW/MT enterprise. The T1 Tracking Layer, awarded in FY 2022, is the minimum viable product proliferated satellite constellation to provide global access for tracking of Hypersonic Glide Vehicles and other advanced missile threats. As a part of the National Defense Space Architecture (NDSA), the LEO MW/MT ground segment leverages the T1 Transport Layer, and T1 Operations and Integration (O&I) Centers to provide MW/MT data to the Warfighter anywhere in the world.

To support the MEO Space layer specific ground functions, the Space Force is transitioning the MEO Track Custody Demonstration (1206442SF, 657009) ground segment to a program of record. It expands the existing MW ground architecture to meet the Command and Control (C2) and Mission Data Processing (MDP) requirements for the new Resilient MW/MT MEO space layer as well as integrates with existing space-based MW capabilities [i.e., Space-Based Infrared System (SBIRS)], planned space-based MW capabilities [i.e., Next-Gen Geosynchronous Earth Orbit (Next-Gen GEO) and Next Gen Polar systems], and interagency MW/MT capabilities [i.e., SDA's Low Earth Orbit (LEO) MW/MT] to ensure that the MW/MT mission is able to meet the detection, tracking, and reporting demands for evolved, dim and maneuvering threats.

The Space Force will perform the systems of systems integration function for both MEO and LEO layers to meet warfighter needs for detection, tracking, and reporting on these challenging missile threats. The Space Force may pursue a competitive award for the lead systems integration to align efforts across MW/MT LEO Space, MEO Space, and MW/MT Ground.

Space acquisition must respond with speed and agility to emerging adversary threats. Space Systems Command (SSC) has transformed 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, SSC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose existing capabilities

This program element may include necessary civilian pay expenses required to manage, execute, and deliver MWMT capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392SF and 1206398SF.

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.

| Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Air Force | Date: April 2022 |
|---|---|
| **Appropriation/Budget Activity**<br>3620F: *Research, Development, Test & Evaluation, Space Force I* BA 5: *System Development & Demonstration (SDD)* | **R-1 Program Element (Number/Name)**<br>PE 1206448SF *I Resilient MW/MT Ground* |

| B. Program Change Summary ($ in Millions) | FY 2021 | FY 2022 | FY 2023 Base | FY 2023 OCO | FY 2023 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Current President's Budget | 0.000 | 0.000 | 390.596 | 0.000 | 390.596 |
| Total Adjustments | 0.000 | 0.000 | 390.596 | 0.000 | 390.596 |
| • 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 | 390.596 | 0.000 | 390.596 |

**Change Summary Explanation**

MW/MT- Ground, BA 5, PE 1206448SF, is a continuation of the following ongoing efforts: 1) SDA RDT&E program elements 1206310SDA and 1206410SDA, and 2) MEO Track Custody Demonstration under PE 1206442SF Next Generation OPIR Budget Program Accounting Code 657009: Space Modernization Initiative. This PE was established for FY2023 and beyond to transition these ongoing efforts into an operational ground architecture supporting the MW/MT - LEO project, PE 1206446SF and MW/MT - MEO project, PE 1206447SF.

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2021 | FY 2022 | FY 2023 |
|---|---|---|---|
| ***Title:*** Missile Warning (MW)/ Missile Tracking (MT) Ground Low Earth Orbit (LEO) | - | 0.000 | 225.797 |

***Description:*** Expands the existing NDSA architecture to meet the Command and Control (C2), Mission Data Processing (MDP), Enterprise Integration, and Support Operations requirements for the T1 Tracking Layer. The LEO MW/MT ground segment provides constellation management, ground-based data processing, dissemination, and management, space-to-ground verification and ground-based interoperability testing, support operations, and other integration activities for the SDA Tranche 1 (T1) Tracking Layer and integrates with the MW/MT enterprise. This includes the connection of T1 Operation and Integration (O&I) centers with legacy and emerging MW/MT capabilities to disseminate MW/MT data in common message formats for rapid response to advanced missile threat.

***FY 2022 Plans:***

This effort continues activities started in RDT&E program elements 1206310SDA and 1206410SDA.

***FY 2023 Plans:***

Rapidly execute the NDSA Tranche 1 programs initiated in FY 2022 to establish the LEO MW/MT ground segment required to support launches starting in FY 2025 and capability demonstration starting in FY 2026. This includes investments in facilities, hardware, network management, Ground Entry Points (GEP), Optical Ground Terminals (OGT), software development, mission

| Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Air Force | Date: April 2022 |
|---|---|
| **Appropriation/Budget Activity**<br>3620F: *Research, Development, Test & Evaluation, Space Force I* BA 5: *System Development & Demonstration (SDD)* | **R-1 Program Element (Number/Name)**<br>PE 1206448SF *I Resilient MW/MT Ground* |

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2021 | FY 2022 | FY 2023 |
|---|---|---|---|
| payloads, contract services, and any other integration requirements to support the MW/MT/MD enterprise. Leverage and expand upon existing Mission Data Processing Applications (MDPAPs) and Joint OPIR Ground initiatives to ensure rapid processing and dissemination to global warfighting community. In addition, this effort will support the planning and execution of performance and integration risk mitigation activities associated with C2 challenges, MDP expansion, and interagency integration. Other activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc.<br>***FY 2022 to FY 2023 Increase/Decrease Statement:***<br>FY 2023 funds increased to establish a new budget program accounting code and allow for a pivot to the Resilient MW/MT architecture. | | | |
| ***Title:*** Missile Warning (MW)/ Missile Tracking (MT) - Ground - Medium Earth Orbit (MEO)<br>***Description:*** Expands the existing MW ground architecture to meet the Command and Control (C2) and Mission Data Processing (MDP) requirements for the new Resilient MW/MT MEO space layer as well as integrates with existing space-based MW capabilities [i.e., Space-Based Infrared System (SBIRS)], planned space-based MW capabilities [i.e., Next-Gen Geosynchronous Earth Orbit (Next-Gen GEO) and Next Gen Polar systems], and interagency MW/MT capabilities [i.e., SDA's Low Earth Orbit (LEO) MW/MT] to ensure that the MW/MT mission is able to meet the detection, tracking, and reporting demands for evolved, dim and maneuvering threats.<br>***FY 2022 Plans:***<br>See PE 1206442SF Next Generation OPIR Budget Program Accounting Code 657009: Space Modernization Initiative Demo Thrust MEO Track Custody Risk Reduction.<br>***FY 2023 Plans:***<br>Continues work in PE 1206442SF to rapidly transition the track custody demo ground segment from a single satellite non-realtime technical pathfinder to a multi-plane, multi-satellite realtime prototype that meets warfighter specified reporting timelines. This program element expands development for Command and Control (C2) and Mission Data Processing (MDP) to meet the initial warfighter capability for sensitivity, accuracy, and latency of the MW/MT MEO space layer. This includes investments in facilities, hardware, ground transport, Ground Entry Points (GEP), contract services, and any other general ground infrastructure required to standup an instantiation of the Future Operationally Resilient Ground Evolution's (FORGE) Mission Data Processing Application Framework (MDPAF) for MDP and establish appropriate C2 solutions. Leverage and expand upon existing Mission Data Processing Applications (MDPAPs) and Joint OPIR Ground initiatives to ensure rapid processing and dissemination to global warfighting community. In addition, this effort will support the planning and execution of performance and integration risk mitigation activities associated with C2 challenges, MDP expansion, and interagency integration. Rapidly respond to implement | - | 0.000 | 164.799 |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Air Force | Date: April 2022 |
|---|---|
| **Appropriation/Budget Activity**<br>3620F: *Research, Development, Test & Evaluation, Space Force I* BA 5: *System Development & Demonstration (SDD)* | **R-1 Program Element (Number/Name)**<br>PE 1206448SF *I Resilient MW/MT Ground* |

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2021 | FY 2022 | FY 2023 |
|---|---|---|---|
| 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.<br><br>***FY 2022 to FY 2023 Increase/Decrease Statement:***<br>FY 2023 funds increased to establish a new budget program accounting code and allow for a pivot to the Resilient MW/MT architecture. | | | |
| **Accomplishments/Planned Programs Subtotals** | - | 0.000 | 390.596 |

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

N/A

**Remarks**

**E. Acquisition Strategy**

LEO: The SDA will continue execution of current contracts competitively awarded in FY 2022 using funds from RDT&E program elements 1206310SDA and 1206410SDA. The SDA T1 programs will execute approved acquisition strategies to deliver a LEO proliferated constellation under the Middle Tier of Acquisition prototyping pathway. The T1 Tracking Layer will be the initial capability to support the architecture derived from the Missile Warning and Missile Defense OPIR Enterprise Capability Development Document (CDD), validated by the Joint Requirements Oversight Council (JROC) in May 2019.

The MW/MT - Ground - LEO project will leverage the efforts in the all of the SDA T1 programs to provide low latency MW/MT data to the MW/MT enterprise.

MEO: The Space Force will continue development of current demonstration contracts competitively awarded using funds from 1206442SF Next Generation OPIR Budget Program Accounting Code 657009. The program will develop an acquisition strategy for transition from a demonstration to a program of record which will include expanding from a single satellite demonstration to a multiple satellite coordinated prototyping effort that provides mission and operational utility. The initial architecture will be based on the Missile Warning and Missile Defense OPIR Enterprise Capability Development Document (CDD), validated by the Joint Requirements Oversight Council (JROC) in May 2019. The first satellites, to fulfill detection and reporting within regions of interest, are required starting in 2028. A transition is planned in FY2023 to support additional development contract modifications and/or awards .

Additionally, the MW/MT - Ground - MEO project may pursue a competitive award for the lead systems integration to align efforts across MW/MT LEO, MEO, and Ground.

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2023 Air Force | | | Date: April 2022 |
|---|---|---|---|
| Appropriation/Budget Activity<br>3620F / 5 | R-1 Program Element (Number/Name)<br>PE 1206448SF / *Resilient MW/MT Ground* | Project (Number/Name)<br>657124 / *Resilient MW/MT* | |

**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2021 Cost | FY 2021 Award Date | FY 2022 Cost | FY 2022 Award Date | FY 2023 Base Cost | FY 2023 Base Award Date | FY 2023 OCO Cost | FY 2023 OCO Award Date | FY 2023 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LEO: C2, Networks, Interoperability, system design, test, and integration | Various | Various : TBD | - | - | | - | | 122.083 | | - | | 122.083 | Continuing | Continuing | - |
| LEO: Data Management | Various | Various : TBD | - | - | | - | | 64.660 | | - | | 64.660 | Continuing | Continuing | - |
| LEO: Ground Infrastructure | Various | Various : TBD | - | - | | - | | 33.870 | | - | | 33.870 | Continuing | Continuing | - |
| MEO: Ground C2 | Various | Various : TBD | - | - | | - | | 36.276 | Mar 2023 | - | | 36.276 | Continuing | Continuing | - |
| MEO: Ground MDP | Various | Various : TBD | - | - | | - | | 50.787 | Dec 2022 | - | | 50.787 | Continuing | Continuing | - |
| MEO: Ground Infrastructure | Various | Various : TBD | - | - | | - | | 25.912 | Mar 2023 | - | | 25.912 | Continuing | Continuing | - |
| MEO: SE&I | Various | Various : TBD | - | - | | - | | 11.194 | Dec 2022 | - | | 11.194 | Continuing | Continuing | - |
| MEO: Lead Systems Integrator | Various | Various : TBD | - | - | | - | | 21.766 | Dec 2022 | - | | 21.766 | Continuing | Continuing | - |
| MEO: Technical Mission Analysis | RO | Aerospace Corporation : El Segundo, CA | - | - | | - | | 2.073 | Jan 2023 | - | | 2.073 | Continuing | Continuing | - |
| | | **Subtotal** | - | - | | - | | 368.621 | | - | | 368.621 | Continuing | Continuing | N/A |

**Management Services ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2021 Cost | FY 2021 Award Date | FY 2022 Cost | FY 2022 Award Date | FY 2023 Base Cost | FY 2023 Base Award Date | FY 2023 OCO Cost | FY 2023 OCO Award Date | FY 2023 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LEO: FFRDC | RO | Aerospace Corp. : El Segundo, CA | - | - | | - | | 2.105 | | - | | 2.105 | Continuing | Continuing | - |
| LEO: Other Support | Various | Various : TBD | - | - | | - | | 3.079 | | - | | 3.079 | Continuing | Continuing | - |
| MEO: FFRDC | RO | Aerospace Corp. : El Segundo, CA | - | - | | - | | 6.219 | Jan 2023 | - | | 6.219 | Continuing | Continuing | - |
| MEO: A&AS | Various | Various : TBD | - | - | | - | | 10.365 | Nov 2022 | - | | 10.365 | Continuing | Continuing | - |
| MEO: Other Support | Various | Various : TBD | - | - | | - | | 0.207 | Nov 2022 | - | | 0.207 | Continuing | Continuing | - |
| | | **Subtotal** | - | - | | - | | 21.975 | | - | | 21.975 | Continuing | Continuing | N/A |

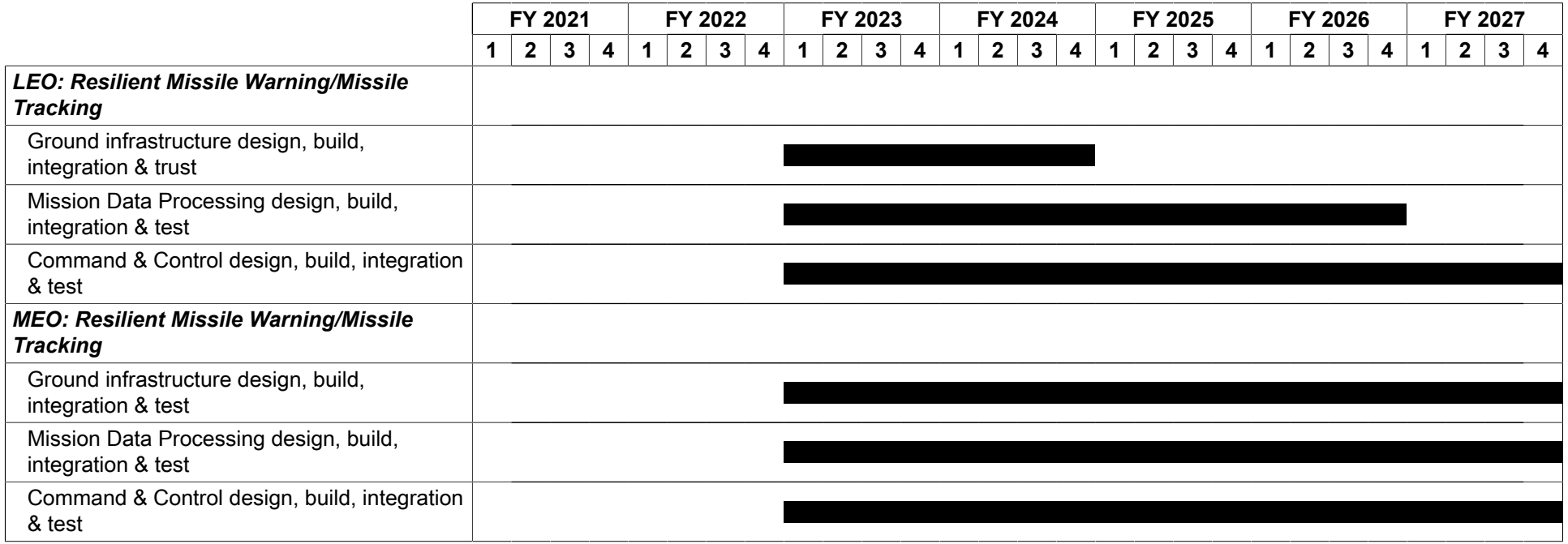
| Exhibit R-3, RDT&E Project Cost Analysis: PB 2023 Air Force | | | Date: April 2022 |
|---|---|---|---|
| Appropriation/Budget Activity<br>3620F / 5 | R-1 Program Element (Number/Name)<br>PE 1206448SF / *Resilient MW/MT Ground* | Project (Number/Name)<br>657124 / *Resilient MW/MT* | |

| | Prior Years | FY 2021 | | FY 2022 | | FY 2023 Base | | FY 2023 OCO | | FY 2023 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | - | - | | - | | 390.596 | | - | | 390.596 | Continuing | Continuing | N/A |

**Remarks**

Funding in FY 2023 is to support necessary government program office activities required to develop the technical requirements, perform market research, solicit, evaluate, award and continue development of the MW/MT ground architecture.

| Exhibit R-4, RDT&E Schedule Profile: PB 2023 Air Force | | Date: April 2022 |
|---|---|---|
| **Appropriation/Budget Activity**<br>3620F / 5 | **R-1 Program Element (Number/Name)**<br>PE 1206448SF / *Resilient MW/MT Ground* | **Project (Number/Name)**<br>657124 / *Resilient MW/MT* |



| Exhibit R-4A, RDT&E Schedule Details: PB 2023 Air Force | | Date: April 2022 |
|---|---|---|
| **Appropriation/Budget Activity**<br>3620F / 5 | **R-1 Program Element (Number/Name)**<br>PE 1206448SF / *Resilient MW/MT Ground* | **Project (Number/Name)**<br>657124 / *Resilient MW/MT* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***LEO: Resilient Missile Warning/Missile Tracking*** | | | | |
| Ground infrastructure design, build, integration & trust | 1 | 2023 | 4 | 2024 |
| Mission Data Processing design, build, integration & test | 1 | 2023 | 4 | 2026 |
| Command & Control design, build, integration & test | 1 | 2023 | 4 | 2027 |
| ***MEO: Resilient Missile Warning/Missile Tracking*** | | | | |
| Ground infrastructure design, build, integration & test | 1 | 2023 | 4 | 2027 |
| Mission Data Processing design, build, integration & test | 1 | 2023 | 4 | 2027 |
| Command & Control design, build, integration & test | 1 | 2023 | 4 | 2027 |