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**Exhibit R-2, RDT&E Budget Item Justification:** PB 2023 Air Force **Date:** April 2022

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 5: System Development &amp; Demonstration (SDD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0605238F / <i>Ground Based Strategic Deterrent EMD</i>
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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	0.000	3,614.290	0.000	3,614.290	3,614.629	3,255.759	3,190.113	2,628.739	4,439.300	20,742.830
655238: <i>GROUND BASED STRATEGIC DETERRENT (GBSD)</i>	0.000	0.000	0.000	3,614.290	0.000	3,614.290	3,614.629	3,255.759	3,190.113	2,628.739	4,439.300	20,742.830
Quantity of RDT&E Articles	-	-	-	5	-	5	3	6	7	-		

**Program MDAP/MAIS Code:** 493

**Note**  
 In FY 2023, Program 0605230F, Ground Based Strategic Deterrent, Project 641025, Ground Based Strategic Deterrent, efforts were transferred to Program 0605238F, Ground Based Strategic Deterrent EMD, Project 655238, Ground Based Strategic Deterrent, in order to account for program transition to System Development and demonstration. (Budget Activity 5).

**A. Mission Description and Budget Item Justification**  
 The Ground Based Strategic Deterrent (GBSD) program will design, develop, produce and deploy a replacement for the current Minuteman III (MM III) Intercontinental Ballistic Missile (ICBM) weapon system in order to maintain a safe, secure, reliable, and effective nuclear deterrent. The GBSD program will deliver a fully integrated weapon system beginning in Fiscal Year 2029 to lower lifecycle costs and 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 systems while examining and mitigating risk during the MM III to GBSD transition. GBSD program office has partnered with MM III program office to facilitate communication and integration of the weapon system recapitalization during the MM III to GBSD transition. This program includes any needed nuclear surety and certification and system vulnerability assessments.

During the Engineering and Manufacturing Development (EMD) phase, the GBSD program will execute 1) government system engineering, analytics, and test capability development; 2) air vehicle equipment development; 3) command & launch systems development; 4) launch systems development; 5) support systems development; and 6) weapon system integration.

Government systems engineering investments include development of 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

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<p>system. Launch systems include launch centers, launch facilities, and structures and associated ground mechanical systems. Support systems include operator and maintainer training systems hardware and software, security system architecture, transport support equipment, program office and weapon system facilities, and peculiar/common support equipment. 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. As GBSD progresses toward Critical Design Review (CDR), the GBSD weapon system design will dictate the parameters for the MILCON real property requirements and their integration with the weapon system component requirements as these are inextricably linked.</p> <p>The increase in funding required for Fiscal Year 2023 is to continue executing the EMD contract to advance GBSD major activities to include systems engineering activities, information technology, data management, analytical capabilities and deliver a flexible, integrated weapon system critical design. The program will 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. This involves establishing a digital engineering system including a supporting environment / infrastructure to perform digital activities, collaborate with, and communicate across stakeholders. Based on success during the Technology Maturation &amp; Risk Reduction contract, this program will continue to examine and mature air vehicle equipment, command and launch, cybersecurity, operator and maintenance training systems hardware and software, security system architecture, transport sub-systems, Peculiar/Common Support Equipment and associated ground technologies. The program will also continue to mature and refine weapon system and non-operational software, software integration and development, modular system architecture requirements, and product life-cycle management. This will continue to require execution and improvement to the unified certification strategy which meets nuclear surety, cyber security, and nuclear safety requirements. The program will also expand and mature the 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. The program will continue to develop Vandenberg Space Force Base (SFB) test capabilities and ensure Western Range Test capabilities for the Flight Test Program. Additionally, the GBSD program funds all required developmental and operational test and evaluation activities to meet initial and full operational capability milestones including, but not limited to, developing, improving and modernizing test capabilities essential to reaching those milestones when existing test capabilities are inadequate or non-existent. The program will also continue integrating the requirement for dual-capable, air based, survivable launch capability. Finally, the program will establish a government-owned and government-operated DevSecOps/ software stack.</p> <p>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 element 0605833F or 0605831F. In FY2021 \$0.000M was expended for civilian pay expenses in this program element, and in FY2022 \$0.000M is forecasted for civilian pay expenses in this program element.</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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<b>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023 Base</b>	<b>FY 2023 OCO</b>	<b>FY 2023 Total</b>
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	0.000	3,614.290	0.000	3,614.290
Total Adjustments	0.000	0.000	3,614.290	0.000	3,614.290
• 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	3,614.290	0.000	3,614.290

**Change Summary Explanation**

The FY 2022 President's Budget submittal did not reflect FY 2023 through FY 2026 funding. Therefore, an explanation of the change between the two budget positions for FY 2023 cannot be made in a relevant manner.

<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>
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<b>Title:</b> Engineering & Manufacturing Development (EMD) Product Development	-	0.000	3,048.121
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**Description:** The EMD Product Development major thrust captures the planned events and activities of the EMD prime contractor in the design, development and test activities of the weapon system. The EMD Product Development major thrust activities are linked with the corresponding EMD Government Support major thrust activities to ensure the government owns-the-technical baseline for the system acquisition. The objectives are: 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.

**FY 2022 Plans:**

N/A

**FY 2023 Plans:**

- Conduct sixteen sub-system critical design reviews (CDRs) for multiple segments of the weapon system including all three stages of the booster stack, guidance computer, and payload shroud.
- Continue to execute the EMD Contract to advance GBSD major activities to include systems engineering activities, information technology, data management, analytical capabilities and deliver a flexible, integrated weapon system critical design.

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<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>
<ul style="list-style-type: none"> <li>• Continue to examine and mature air vehicle equipment, command and launch, cybersecurity, operator and maintenance training systems hardware and software, security system architecture, transport sub-systems, and associated ground technologies. Refine requirements and modular architectures through trade studies, prototyping, demonstration, and analysis.</li> <li>• Continue to build and refine Mission Modeling Framework (MMF) by incorporating higher-fidelity weapon system designs and updates to threat landscape to facilitate ongoing assessment of weapon system performance against the authoritative threat.</li> <li>• 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.</li> <li>• Continue to mature the weapon system by conducting trade studies, system engineering, test activities, and system modeling and simulation.</li> <li>• Continue to assess fielding requirements for air vehicle equipment, command &amp; launch, and launch systems and appropriate timelines to transition from MM III to GBSD solution.</li> <li>• Conduct planning for the use of MBSE tools during Operations and Sustainment phase in order to transform ICBM sustainment and supply chain management.</li> <li>• Continue to mature and refine weapon system and non-operational software, software integration and development, modular system architecture requirements, and product life-cycle management.</li> <li>• Continue to further develop analytical, information technology, and data management capabilities.</li> <li>• Continue to implement information systems and information technology design to support EMD execution.</li> <li>• Continue to plan and execute critical software risk reduction activities.</li> <li>• Continue to expand and mature the 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.</li> <li>• Continue to expand large data ingest capabilities to support consumption of flight test and Model Based Architecture and Software Engineering data.</li> <li>• Continue to execute and improve the unified certification strategy which meets nuclear surety, cyber security, and nuclear safety requirements.</li> <li>• Continue to plan, develop, mature capability integration with the Nuclear Command, Control, and Communications (NC3) Center for future command, control, and communication requirements.</li> <li>• Continue to collaborate with National Nuclear Security Administration to ensure seamless integration of Department of Energy assets into GBSD weapon system.</li> <li>• Continue to integrate the Mk21A Reentry Vehicle (Program 0101328F), ICBM Fuze Modernization (Program 0604933F), and GBSD test programs.</li> <li>• Continue to integrate the requirement for dual-capable, air-based, survivable launch capability.</li> <li>• Continue to develop and test reentry vehicles to meet joint Department of Energy and Department of Defense specific requirements.</li> </ul>			

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<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>
<ul style="list-style-type: none"> <li>• Continue to plan, develop, and mature support systems to include Common Support Equipment/Peculiar Support Equipment and all transportation equipment.</li> <li>• Continue to conduct studies and initiatives to build schedule margin, reduce risk in the MM III-to-GBSD transition, and reduce life cycle costs as the program progresses through the EMD phase to the Production phase.</li> <li>• Continue activities necessary to plan, program, and execute weapon system structures needed to support program milestones and test objectives.</li> <li>• RDT&amp;E quantities are built and delivered by the prime contractor to utilize in prototyping and design testing as the prime contractor progresses toward the final design solution and hardware needed for First Flight.</li> <li>• Complete the solid rocket motor development tests (1 per stage).</li> <li>• Complete LF-04 and LF-26 construction and weapon system install.</li> </ul> <p><b>FY 2022 to FY 2023 Increase/Decrease Statement:</b> Funding increased due to continued ramp up of EMD efforts to execute sub-system Critical Design Reviews (CDR) in preparation for System Qualification and Verification Review and initiation of solid rocket motor development testing.</p>				
<p><b>Title:</b> EMD Government Support</p> <p><b>Description:</b> The EMD Government Support major thrust captures planned events and activities for government agencies, Federally Funded Research and Development Centers (FFRDCs), University Affiliated Research Centers (UARCs), and other partners in the support of the EMD prime contractor efforts in design, development, and test of the weapon system. The EMD Government Support major thrust activities are linked with the corresponding EMD Product Development major thrust activities to ensure the government owns the technical baseline for the system acquisition. The objectives are: 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><b>FY 2022 Plans:</b> N/A</p> <p><b>FY 2023 Plans:</b></p> <ul style="list-style-type: none"> <li>• Continue to 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. This involves establishing a digital engineering system including a supporting environment/infrastructure to perform digital activities, collaborate with, and communicate across stakeholders.</li> </ul>		-	0.000	566.169

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<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>
<ul style="list-style-type: none"> <li>• Continue to examine and mature air vehicle equipment, command and launch, cybersecurity, operator and maintenance training systems hardware and software, security system architecture, transport sub-systems, and associated ground technologies. Refine requirements and modular architectures through trade studies, prototyping, demonstration, and analysis.</li> <li>• Continue to assess fielding requirements for air vehicle equipment, command and launch, and launch systems and appropriate timelines to transition from MM III to GBSD solution.</li> <li>• Continue to conduct studies and initiatives to build schedule margin, reduce risk in the Minuteman III-to-GBSD transition, and reduce life cycle costs as the program progresses through the EMD phase to the Production phase.</li> <li>• Continue to mature and refine weapon system and non-operational software, software integration and development, modular system architecture requirements, and product life-cycle management.</li> <li>• 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.</li> <li>• Continue to execute all government critical path activities to include, but not limited to, Preliminary Draft Environmental Impact Statement (PDEIS), Coordinating Draft Environmental Impact Studies (EIS), Environmental Baseline Surveys, and Section 106 Programmatic Agreement.</li> <li>• Continue to mature the weapon system by conducting trade studies, system engineering, test activities, and system modeling and simulation.</li> <li>• Continue to build and refine MMF by incorporating higher-fidelity weapon system designs and updates to threat landscape to facilitate ongoing assessment of weapon system performance against the authoritative threat.</li> <li>• Continue to expand large data ingest capabilities to support consumption of flight test and Model Based Architecture and Software Engineering data.</li> <li>• Conduct planning for the use of MBSE tools during Operations and Sustainment phase in order to transform ICBM sustainment and supply chain management.</li> <li>• Continue to further develop analytical, information technology, and data management capabilities.</li> <li>• Continue to implement information systems and information technology design to support EMD execution.</li> <li>• Continue to expand and mature the 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.</li> <li>• Continue to build and establish an industrial base for innovation around the GBSD enterprise to maintain modularity and adaptability for the life cycle of the weapon system.</li> <li>• Continue to plan and execute critical software risk reduction activities.</li> <li>• Continue to expand the Information Systems/Information Technology/Information Assurance infrastructure networks and personnel required to support Top Secret, Special Access Programs, and collateral activities and expand capability at mission partner operating locations and network access points.</li> </ul>			

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<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>
<ul style="list-style-type: none"> <li>• Continue to expand government-owned and government-operated DevSecOps/software stack to include data and software artifact transport between classified environments using cross domain solutions.</li> <li>• Continue to refine Security Classification Guide, update impacts, and implement updates and changes through all Government and contractor programmatic activities.</li> <li>• Continue to integrate the Mk-21A Reentry Vehicle (Program 0101328F), ICBM Fuze Modernization (Program 0604933F), and GBSD test programs.</li> <li>• Continue to execute and improve the unified certification strategy which meets nuclear surety, cyber security, and nuclear safety requirements.</li> <li>• Continue to develop a common cryptographic device and supporting equipment for use in multiple subsystems and/or networks throughout the GBSD weapon system.</li> <li>• Continue to plan, develop, and mature capability integration with the NC3 Center for future command, control, and communication requirements.</li> <li>• Continue to increase FFRDC/UARC support to maintain the ability to own the technical baseline in EMD.</li> <li>• Continue to collaborate with National Nuclear Security Administration to ensure seamless integration of Department of Energy (DoE) assets into GBSD weapon system.</li> <li>• Continue to develop test re-entry vehicles to meet joint DoE/DoD specific requirements.</li> <li>• Continue to integrate requirement for dual-capable, air-based, survivable launch capability.</li> <li>• Continue to develop, improve &amp; modernize government test capabilities required for successful Developmental Test (DT) and Operational Test (OT) including but not limited to, Vandenberg SFB test capabilities, Western Range Test capabilities, Broad Ocean Area Terminal Area Scoring Test Capability, and various noise, vibration and harshness and nuclear hardness and survivability test sites/beds as required. Prepare &amp; verify test capabilities' readiness to support the flight test campaign commencing in FY24. Leverage digital engineering tools &amp; physical test data to mature Modeling &amp; Simulation tools toward authoritative virtualization.</li> <li>• Continue activities necessary to plan, program, and execute weapon system structures needed to support program milestones and test objectives.</li> <li>• Continue to plan, develop, and mature support systems to include Common Support Equipment/Peculiar Support Equipment and all transportation equipment.</li> <li>• Continue to modify and expand GBSD workspace at all operating locations to accommodate a growing workforce and provide the tools for the workforce to own the technical baseline.</li> <li>• Complete the solid rocket motor development tests (1 per stage).</li> <li>• Complete LF-04 and LF-26 construction and weapon system install.</li> </ul> <p><b><i>FY 2022 to FY 2023 Increase/Decrease Statement:</i></b></p>				

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<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 5: System Development &amp; Demonstration (SDD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0605238F / <i>Ground Based Strategic Deterrent EMD</i>
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<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>
Funding increased due to continued ramp up of EMD efforts to execute sub-system Critical Design Reviews (CDR) in preparation for System Qualification and Verification Review and initiation of solid rocket motor development testing.			
<b>Accomplishments/Planned Programs Subtotals</b>	-	0.000	3,614.290

<b>D. Other Program Funding Summary (\$ in Millions)</b>											
<b>Line Item</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023 Base</b>	<b>FY 2023 OCO</b>	<b>FY 2023 Total</b>	<b>FY 2024</b>	<b>FY 2025</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
• RDTE 04 PE 0605230F: <i>Ground Based Strategic Deterrent</i>	1,397.485	2,553.541	-	-	-	-	-	-	-	0.000	3,951.026
• RDTE 04 PE 0603851F: <i>Intercontinental Ballistic Missile - Dem/Val</i>	34.755	49.621	46.432	-	46.432	16.717	28.424	7.821	7.995	Continuing	Continuing
• MPAF 01 Line Item MGBSD0: <i>Ground Based Strategic Deterrent</i>	0.000	10.895	0.000	-	0.000	610.586	502.720	5,689.931	6,410.554	48,355.610	61,580.296
• MILCON PE 0101233F: <i>GBSD SQUADRONS</i>	89.200	168.099	434.000	-	434.000	218.152	301.547	694.984	709.093	6,078.493	8,693.568
• O&M PE 0101233F: <i>GBSD SQUADRONS</i>	3.404	20.001	40.915	-	40.915	51.351	90.363	42.767	64.843	0.000	313.644
• OPAF 03 WSC 834130: <i>AF Physical Security System</i>	0.000	0.000	2.839	-	2.839	0.000	0.000	0.000	0.000	0.000	2.839

**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 Fiscal Year 2029. For the Engineering and Manufacturing Development (EMD) phase of this strategy, the Program Office awarded an EMD contract in the 4th quarter of Fiscal Year 2020. The objectives of EMD for GBSD are as follows: 1) to deliver low-risk, technologically mature, integrated weapon system baseline design; 2) develop flexible system architecture with options for future on-ramps and off-ramps to mitigate program risks; 3) embrace MBSE/digital engineering to streamline system development activities and timelines; 4) align contract incentives to mitigate schedule and performance risk; 5) utilize MBSE processes and tools to create schedule margin and accelerate surety, safety, cyber, and test activities for time certain delivery; 6) ensure government owns key interfaces and data rights; and 7) pursue "smart commonality" with Navy, Space, and Missile Defense Agency. The EMD phase includes an EMD Baseline Review, Critical Design Review, First Flight Test, Full Functional System Test, System Qualification/System Verification Review, Nuclear Certification, Developmental Test, Operational Test, and culminates with early production and weapon system deployment. The program will also assess the cost and schedule risks associated with every requirement. The EMD contract includes 5 options for early production and deployment. The period of performance, to include the production and deployment options,

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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 0605238F / *Ground Based Strategic Deterrent EMD*

is fourth quarter of Fiscal Year 2020 to the second quarter of Fiscal Year 2028. These efforts will ultimately extend the capabilities of the ground-based leg of the nuclear triad through 2075.

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**Exhibit R-3, RDT&E Project Cost Analysis: PB 2023 Air Force** **Date:** April 2022

<b>Appropriation/Budget Activity</b> 3600 / 5	<b>R-1 Program Element (Number/Name)</b> PE 0605238F / Ground Based Strategic Det errent EMD	<b>Project (Number/Name)</b> 655238 / GROUND BASED STRATEGIC DETERRENT (GBSD)
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<b>Product Development (\$ in Millions)</b>				FY 2021		FY 2022		FY 2023 Base		FY 2023 OCO		FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract
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 EMD Contract	C/CPIF	Northrop Grumman Sys Corp : El Segundo, CA	0.000	-		-		3,048.121	Oct 2022	-		3,048.121	6,906.121	9,954.242	13,293.563
<b>Subtotal</b>			0.000	-		-		3,048.121		-		3,048.121	6,906.121	9,954.242	N/A

**Remarks**  
 Prior to Fiscal Year 2023, funding for these efforts was included under Program 0605230F, Ground Based Strategic Deterrent.  
 GBSD EMD Contract Total Cost is anticipated to be \$13,293.563 million. Funding is split between programs 0605230F, Ground Based Strategic Deterrent and 0605238F, Ground Based Strategic Deterrent EMD.

<b>Support (\$ in Millions)</b>				FY 2021		FY 2022		FY 2023 Base		FY 2023 OCO		FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Integration Support Contract	C/FFP	TBD : Hill AFB, UT	0.000	-		-		112.700	Oct 2022	-		112.700	570.693	683.393	519.735
Naval Surface Warfare Center Crane Support	MIPR	Naval Surface Warfare Center Crane : Crane, IN	0.000	-		-		7.600	Nov 2022	-		7.600	32.970	40.570	-
Aerospace FFRDC Support	MIPR	Aerospace Corporation : El Segundo, CA	0.000	-		-		24.656	Nov 2022	-		24.656	105.871	130.527	-
MITRE FFRDC Support	MIPR	MITRE : Bedford, MA	0.000	-		-		16.200	Nov 2022	-		16.200	95.000	111.200	-
Carnegie Mellon Software Engineering Institute Support	MIPR	Carnegie Mellon : Pittsburgh, PA	0.000	-		-		2.000	Nov 2022	-		2.000	13.506	15.506	-
Sandia FFRDC Reentry Systems Analysis Support	MIPR	Sandia National Laboratories : Various	0.000	-		-		4.000	Oct 2022	-		4.000	56.839	60.839	-
MIT Lincoln Labs FFRDC Reentry Systems Analysis Support	MIPR	MIT Lincoln Labs : Lexington, MA	0.000	-		-		1.600	Oct 2022	-		1.600	9.410	11.010	-

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**Exhibit R-3, RDT&E Project Cost Analysis: PB 2023 Air Force** **Date:** April 2022

<b>Appropriation/Budget Activity</b> 3600 / 5	<b>R-1 Program Element (Number/Name)</b> PE 0605238F / Ground Based Strategic Det errent EMD	<b>Project (Number/Name)</b> 655238 / GROUND BASED STRATEGIC DETERRENT (GBSD)
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<b>Support (\$ in Millions)</b>				FY 2021		FY 2022		FY 2023 Base		FY 2023 OCO		FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Operations Research Analyst Support	C/FFP	Tecolote Research : Hill AFB, UT	0.000	-		-		4.020	Oct 2022	-		4.020	23.840	27.860	35.487
Nuclear Surety & Certification Support	MIPR	Various : Various	0.000	-		-		5.300	Nov 2022	-		5.300	22.332	27.632	-
Common Cryptographic Equipment	MIPR	Sandia National Labs : Various	0.000	-		-		4.200	Nov 2022	-		4.200	44.772	48.972	-
Mantech Support	RO	Man Tech International : Herndon, VA	0.000	-		-		12.440	Dec 2022	-		12.440	64.408	76.848	-
GBSD Direct Cite Civilian Pay	Various	US Gov Civilians : Hill AFB, UT	0.000	-		-		50.000	Oct 2022	-		50.000	210.367	260.367	-
NEPA Analysis Support	MIPR	Various : Various	0.000	-		-		3.000	Nov 2022	-		3.000	1.177	4.177	-
Reentry Vehicle Sustainment Support	C/CPAF	Lockheed Martin Corp : Bethesda, MD	0.000	-		-		2.000	Dec 2022	-		2.000	12.444	14.444	-
Sandia Integration Support	MIPR	Sandia National Labs : Various	0.000	-		-		2.000	Jan 2023	-		2.000	0.000	2.000	-
GBSD Facility Execution Support	MIPR	Various : Various	0.000	-		-		2.500	Jan 2023	-		2.500	0.000	2.500	-
Space Dynamics Lab Support	MIPR	USU Space Dynamics Lab : Logan, UT	0.000	-		-		2.000	Nov 2022	-		2.000	0.000	2.000	-
GBSD Enterprise Support	C/Various	Various : Various	0.000	-		-		1.434	Dec 2022	-		1.434	906.329	907.763	-
<b>Subtotal</b>			0.000	-		-		257.650		-		257.650	2,169.958	2,427.608	N/A

**Remarks**  
 Prior year's funding included under Program 0605230F, Ground Based Strategic Deterrent.  
 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 thus increasing costs within Cost Category Items.  
 - Integration Support Contractor will be defined upon follow-on contract award 4th Qtr FY22.  
 In order to improve transparency, cost category items were changed as follows:  
 - GBSD Electronic Parts Strategy and Commonality renamed as Naval Surface Warfare Center Crane Support.  
 - GBSD System Engineering and Acquisition Support renamed as Aerospace FFRDC Support.  
 - GBSD Acquisition Support and System Engineering renamed as MITRE FFRDC Support.  
 - GBSD Software Engineering Institute renamed as Carnegie Mellon Software Engineering Institute Support.

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**Exhibit R-3, RDT&E Project Cost Analysis: PB 2023 Air Force** **Date:** April 2022

<b>Appropriation/Budget Activity</b> 3600 / 5	<b>R-1 Program Element (Number/Name)</b> PE 0605238F / Ground Based Strategic Det errent EMD	<b>Project (Number/Name)</b> 655238 / GROUND BASED STRATEGIC DETERRENT (GBSD)
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<b>Support (\$ in Millions)</b>				FY 2021		FY 2022		FY 2023 Base		FY 2023 OCO		FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract
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 Reentry Systems (RS) FFRDC Support and Analysis renamed Sandia FFRDC Reentry Systems Analysis Support. - GBSD RS FFRDC Analysis and Acquisition Intelligence Support renamed MIT Lincoln Labs FFRDC Reentry Systems Analysis Support. - GBSD Surety and Certification Engineering Services renamed Nuclear Surety & Certification Support. - GBSD Administrative Support moved to Management Services Category. - GBSD Technical Design Agent for NC2 Codes/Crypto renamed as Common Cryptographic Equipment. - GBSD Civilian Manpower renamed Civilian Direct Cite Authority Manpower. - RV LM OEM Support renamed as Reentry Vehicle Sustainment Support. New item: Space Dynamics Lab Support															

<b>Test and Evaluation (\$ in Millions)</b>				FY 2021		FY 2022		FY 2023 Base		FY 2023 OCO		FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Johns Hopkins - Applied Physics Lab Support	MIPR	Johns Hopkins University-Applied Physics Lab : Laurel, MD	0.000	-		-		25.000	Oct 2022	-		25.000	146.390	171.390	-
Arnold Engineering Development Complex - Integrated Test Team	PO	Arnold Engineering Development Complex : Arnold AFB, TN	0.000	-		-		20.340	Oct 2022	-		20.340	219.086	239.426	-
Air Force Operational Test and Evaluation Center - Integrated Test Team	PO	Air Force Operational Test and Evaluation Center : Hill AFB, UT	0.000	-		-		3.500	Oct 2022	-		3.500	199.527	203.027	-
Missile & Intelligence Center - Integrated Threat Analysis and Simulation Environment	MIPR	DIA-Missile and Space Intelligence Center : Redstone Arsenal, AL	0.000	-		-		5.000	Nov 2022	-		5.000	26.259	31.259	-
National Air and Space Intelligence Center - Integrated Threat Analysis and Simulation Environment	MIPR	National Air and Space Intelligence Center : Fairborn, OH	0.000	-		-		1.000	Nov 2022	-		1.000	4.260	5.260	-
30th Space Wing Base Support	Various	Various : Various	0.000	-		-		0.760	Dec 2022	-		0.760	0.000	0.760	-

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**Exhibit R-3, RDT&E Project Cost Analysis: PB 2023 Air Force** **Date:** April 2022

<b>Appropriation/Budget Activity</b> 3600 / 5	<b>R-1 Program Element (Number/Name)</b> PE 0605238F / Ground Based Strategic Det errent EMD	<b>Project (Number/Name)</b> 655238 / GROUND BASED STRATEGIC DETERRENT (GBSD)
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<b>Test and Evaluation (\$ in Millions)</b>				FY 2021		FY 2022		FY 2023 Base		FY 2023 OCO		FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
309th SMXG Software Engineering Support	PO	309th / 517th SWEG : Hill AFB, UT	0.000	-		-		29.282	Oct 2022	-		29.282	275.890	305.172	-
309th SMXG Nuclear Safety Cross Check Analysis	PO	309th / 516th SWES : Hill AFB, UT	0.000	-		-		13.500	Oct 2022	-		13.500	74.825	88.325	-
Silo Fly-out Modeling and Simulation	MIPR	Various : Various	0.000	-		-		5.500	Nov 2022	-		5.500	17.264	22.764	-
Rapid Assessment Technology	MIPR	Various : Various	0.000	-		-		5.115	Mar 2023	-		5.115	8.129	13.244	-
Sandia Flight Test Vehicle Development	MIPR	Sandia National Labs : Various	0.000	-		-		16.200	Dec 2022	-		16.200	24.483	40.683	-
Lawrence Livermore Joint Environmental Test Unit	MIPR	Lawrence Livermore Labs : Livermore, CA	0.000	-		-		0.850	Dec 2022	-		0.850	66.337	67.187	-
Naval Surface Warfare Center Corona Support	MIPR	Naval Surface Warfare Center : Corona, CA	0.000	-		-		1.255	Dec 2022	-		1.255	8.402	9.657	-
RAND Study Support	MIPR	RAND Corp : Santa Monica, CA	0.000	-		-		0.665	Jan 2023	-		0.665	0.000	0.665	-
Combined Test Facility Support	MIPR	Various : Various	0.000	-		-		1.500	Nov 2022	-		1.500	0.000	1.500	-
Broad Ocean Area Terminal Area Scoring Test Capability	MIPR	Navy Strat. Sys. Programs : Various	0.000	-		-		52.310	Nov 2022	-		52.310	0.000	52.310	-
GBSD Enterprise Test and Assessments	C/Various	Various : Various	0.000	-		-		0.540	Nov 2022	-		0.540	5,506.729	5,507.269	-
<b>Subtotal</b>			0.000	-		-		182.317		-		182.317	6,577.581	6,759.898	N/A

**Remarks**  
 Prior year's funding included under Program 0605230F, Ground Based Strategic Deterrent.  
 In order to improve transparency, cost category items were renamed as follows:  
 - GBSD Cybersecurity, Test, and Evaluation Framework, Codes/Crypto renamed as Johns Hopkins - Applied Physics Lab Support.  
 - GBSD Integrated Test Team renamed as Arnold Engineering Development Complex - Integrated Test Team.  
 - GBSD Independent Operational Test Agency renamed to Air Force Operational Test and Evaluation Center - Integrated Test Team.  
 - GBSD Integrated Threat Analysis and Simulation Environment (ITASE) 1 renamed to Missile & Intelligence Center - Integrated Threat Analysis and Simulation Environment.

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**Exhibit R-3, RDT&E Project Cost Analysis: PB 2023 Air Force** **Date:** April 2022

<b>Appropriation/Budget Activity</b> 3600 / 5	<b>R-1 Program Element (Number/Name)</b> PE 0605238F / Ground Based Strategic Det errent EMD	<b>Project (Number/Name)</b> 655238 / GROUND BASED STRATEGIC DETERRENT (GBSD)
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<b>Test and Evaluation (\$ in Millions)</b>				FY 2021		FY 2022		FY 2023 Base		FY 2023 OCO		FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract
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 ITASE 2 renamed to National Air and Space Intelligence Center - Integrated Threat Analysis and Simulation Environment. - GBSD Launch Systems LF-26 (TMRR) renamed to 30th Space Wing Base Support. - GBSD Software Support renamed to 309th SMXG Software Engineering Support. - GBSD NSCCA Support renamed to 309th SMXG Nuclear Safety Cross Check Analysis. - GBSD / Mission Defense Agency Silo Fly-out Modelling / Simulation Development renamed to Silo Fly-out Modeling and Simulation. - GBSD Rapid Assessment Technology / LS Support renamed to Rapid Assessment Technology. - GBSD Joint Test Assembly Encryption renamed to Sandia Flight Test Vehicle Development. - GBSD Joint Environment Test Unit / Joint Test Assembly National Nuclear Security Agency Cost Share renamed to Lawrence Livermore Joint Environmental Test Unit. - NSWV Corona Support renamed to Naval Surface Warfare Center Corona Support. New item: Broad Ocean Area Terminal Area Scoring Test Capability															

<b>Management Services (\$ in Millions)</b>				FY 2021		FY 2022		FY 2023 Base		FY 2023 OCO		FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract
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 Administrative Support	C/FFP	Delta Solutions, Inc. : Colorado Springs, CO	0.000	-		-		0.887	Nov 2022	-		0.887	152.063	152.950	277.170
GBSD Enterprise Process Improvement Support	C/FFP	Booz Allen Hamilton : McLean, VA	0.000	-		-		11.000	Nov 2022	-		11.000	14.130	25.130	-
Hardware, Software, IT Resources	C/Various	Various : Various	0.000	-		-		43.378	Oct 2022	-		43.378	64.960	108.338	-
GBSD DevSecOps, Software Factory, Cloud, & Infrastructure	Various	Various : Various	0.000	-		-		57.947	Nov 2022	-		57.947	235.537	293.484	-
Operating Location Support	Various	Various : Various	0.000	-		-		7.500		-		7.500	0.000	7.500	-
Enterprise PMA	Various	Various : Various	0.000	-		-		5.490	Oct 2022	-		5.490	217.155	222.645	-
<b>Subtotal</b>			0.000	-		-		126.202		-		126.202	683.845	810.047	N/A

**Remarks**  
 Prior year's funding included under Program 0605230F, Ground Based Strategic Deterrent.  
 GBSD Integration Support Contract has been incorporated into the Integration Support Contract in the Support Category.

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**Exhibit R-3, RDT&E Project Cost Analysis: PB 2023 Air Force** **Date:** April 2022

<b>Appropriation/Budget Activity</b> 3600 / 5	<b>R-1 Program Element (Number/Name)</b> PE 0605238F / <i>Ground Based Strategic Deterrent EMD</i>	<b>Project (Number/Name)</b> 655238 / <i>GROUND BASED STRATEGIC DETERRENT (GBSD)</i>
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<b>Management Services (\$ in Millions)</b>				FY 2021		FY 2022		FY 2023 Base		FY 2023 OCO		FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract
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 has been incorporated into Naval Surface Warfare Center Crane Support in the Support Category.  
 GBSD System Engineering and Acquisition Support has been incorporated into the Aerospace FFRDC Support in the Support Category.  
 GBSD IS/IT Support renamed to Hardware, Software, IT Resources.  
 New item: Operating Location Support

	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract
<b>Project Cost Totals</b>	0.000	-	-	3,614.290	-	3,614.290	16,337.505	19,951.795	N/A

**Remarks**  
 In FY23, GBSD program transitioned from Budget Activity 04 to Budget Activity 05 and EMD efforts transitioned to PE 0605238F, Ground Based Strategic Deterrent EMD, Project 655238, Ground Based Strategic Deterrent from PE 0605230F, Ground Based Strategic Deterrent.

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<b>Exhibit R-4, RDT&amp;E Schedule Profile:</b> PB 2023 Air Force			<b>Date:</b> April 2022				
<b>Appropriation/Budget Activity</b> 3600 / 5		<b>R-1 Program Element (Number/Name)</b> PE 0605238F / <i>Ground Based Strategic Deterrent EMD</i>			<b>Project (Number/Name)</b> 655238 / <i>GROUND BASED STRATEGIC DETERRENT (GBSD)</i>		

FY 2021				FY 2022				FY 2023				FY 2024				FY 2025				FY 2026				FY 2027			
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>Ground Based Strategic Deterrent (GBSD)</b>	
EMD Phase	[Redacted]
Solid Rocket Motor Development Tests (Jan 2023)	[Redacted]
Payload Shroud Critical Design Review (Dec 2022)	[Redacted]
Boosters Critical Design Review (Jan 2023)	[Redacted]
Guidance and Control Critical Design Review (Apr 2023)	[Redacted]
LF-04 Construction Complete (Feb 2023)	[Redacted]
LF-26 Construction Complete (Apr 2023)	[Redacted]
SLP-A Critical Design Review (Jul 2023)	[Redacted]
First Developmental Flight Test (Dec 2023)	[Redacted]
Critical Design Review (May 2024)	[Redacted]
Full System Functional Test (Mar 2025)	[Redacted]
SLP-A Capability (Jan 2026)	[Redacted]
System Qualification/Verification Review (Oct 2025)	[Redacted]
Milestone C (May 2026)	[Redacted]
Production and Deployment Phase	[Redacted]
Operational Weapon System Article (Sep 2027)	[Redacted]

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<b>Exhibit R-4A, RDT&amp;E Schedule Details:</b> PB 2023 Air Force		Date: April 2022
<b>Appropriation/Budget Activity</b> 3600 / 5	<b>R-1 Program Element (Number/Name)</b> PE 0605238F / <i>Ground Based Strategic Deterrent EMD</i>	<b>Project (Number/Name)</b> 655238 / <i>GROUND BASED STRATEGIC DETERRENT (GBSD)</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<b>Ground Based Strategic Deterrent (GBSD)</b>				
EMD Phase	1	2021	3	2026
Solid Rocket Motor Development Tests (Jan 2023)	4	2022	4	2022
Payload Shroud Critical Design Review (Dec 2022)	1	2023	1	2023
Boosters Critical Design Review (Jan 2023)	2	2023	2	2023
Guidance and Control Critical Design Review (Apr 2023)	3	2023	3	2023
LF-04 Construction Complete (Feb 2023)	2	2023	2	2023
LF-26 Construction Complete (Apr 2023)	3	2023	3	2023
SLP-A Critical Design Review (Jul 2023)	4	2023	4	2023
First Developmental Flight Test (Dec 2023)	1	2024	1	2024
Critical Design Review (May 2024)	3	2024	3	2024
Full System Functional Test (Mar 2025)	2	2025	2	2025
SLP-A Capability (Jan 2026)	2	2026	2	2026
System Qualification/Verification Review (Oct 2025)	1	2026	1	2026
Milestone C (May 2026)	3	2026	3	2026
Production and Deployment Phase	4	2026	4	2027
Operational Weapon System Article (Sep 2027)	4	2027	4	2027