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Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

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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COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	474.169	401.244	557.495	1,524.759	0.000	1,524.759	2,536.450	3,034.370	3,072.837	3,031.610	7,327.795	21,960.729
641025: <i>GROUND BASED STRATEGIC DETERRENT (GBSD)</i>	474.169	401.244	557.495	1,524.759	0.000	1,524.759	2,536.450	3,034.370	3,072.837	3,031.610	7,327.795	21,960.729
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-	-	-

Program MDAP/MAIS Code: 493

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 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 during Technology Maturation and Risk Reduction phase for 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; 5) support systems risk reduction; and 6) weapon system integration risk reduction.

During the Engineering and Manufacturing Development 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 system. Launch systems include launch control center, launch facility restoration, modernization of real property, and structures and associated ground mechanical systems. Support systems include operator and maintenance trainer hardware and software, security system architecture, and transport support equipment, program

UNCLASSIFIED

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----------------------------------------------------------------------------	----------------------------

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office and weapon system facilities, and 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.

The significant increase in funding required for FY21 and beyond is to execute the Engineering & Manufacturing Development (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 & Risk Reduction contract, this program will continue to examine and mature air vehicle equipment, command and launch, cybersecurity, operator and maintenance trainer hardware and software, security system architecture, transport sub-systems, 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 AFB test capabilities and ensure Western Range Test capabilities for the Flight Test Program. The program will also continue integrating requirement for dual-capable, air-based, survivable launch capability. Finally, the program will establish a government-owned and government-operated DevSecOps/software stack.

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 0605831F or 0605833F.

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 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	414.441	570.373	1,527.545	0.000	1,527.545
Current President's Budget	401.244	557.495	1,524.759	0.000	1,524.759
Total Adjustments	-13.197	-12.878	-2.786	0.000	-2.786
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	-100.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	65.100			
• Congressional Directed Transfers	0.000	22.022			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	-13.197	0.000			
• Other Adjustments	0.000	0.000	-2.786	0.000	-2.786

UNCLASSIFIED

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----------------------------------------------------------------------------	----------------------------

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Congressional Add Details (\$ in Millions, and Includes General Reductions)	FY 2019	FY 2020
Project: 641025: <i>GROUND BASED STRATEGIC DETERRENT (GBSD)</i>		
Congressional Add: <i>Congressional Add- Risk Reduction</i>	0.000	65.100
Congressional Add: <i>Congressional Directed Transfer- SLP-A</i>	0.000	22.022
Congressional Add Subtotals for Project: 641025		
	0.000	87.122
Congressional Add Totals for all Projects		
	0.000	87.122

Change Summary Explanation

FY 2019 funding reflects a Small Business Innovation Research adjustment of \$13.197 million.
 FY 2020 funding reflects a Congressional directed reduction of \$100 million for "TMRR contract funding excess to need." FY2020 also includes a Congressional Add of \$65.1 million for "Risk Reduction" and a \$22.022 million Congressional Directed Transfer.

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
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Title: Technology Maturation & Risk Reduction (TMRR)	401.244	361.705	0.000
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 2020 Plans:			
<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 Engineering and Manufacturing Development (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 cloud-enabled environment to perform digital activities, collaborate with, and communicate across stakeholders. • 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 weapon system and non-operational software, software integration and development, 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. 			

UNCLASSIFIED

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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
<ul style="list-style-type: none"> • 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 government and contractors. • Implement information systems and information technology design to support enterprise operations and TMRR closure. • Modify and expand GBSD workspace infrastructure to accommodate a growing workforce. • Continue to assess the fielding implications for air vehicle equipment, and command & launch 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; and to aid in the migration and analysis of Minuteman III data to GBSD. • Complete Software Specification Review, 9th Quarter Technical Interchange Meeting, and the Preliminary Design Review. • Develop and execute a unified certification strategy which meets nuclear surety, cyber security, and nuclear safety requirements. • 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 Federally Funded Research and Development Center (FFRDC) support to maintain the ability to own the technical baseline. • Continue to refine Security Classification Guide, update impacts, and implement updates and changes through all Government and contractor programmatic activities. • Establish government-owned and government-operated DevSecOps/software stack. <p>FY 2021 Plans: N/A</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: Funding decreased due to completion of Technology Maturation and Risk Reduction in fourth quarter of Fiscal Year 2020.</p>				
<p>Title: Engineering & Manufacturing Development (EMD)</p> <p>Description: 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>FY 2020 Plans:</p> <ul style="list-style-type: none"> • Conduct source selection to award EMD contract in 4QFY20. • Implement information systems and information technology design to support EMD execution. 		0.000	108.668	1,524.759

UNCLASSIFIED

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----------------------------------------------------------------------------	----------------------------

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----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
<ul style="list-style-type: none"> • Modify and expand GBSD workspace infrastructure to accommodate a growing workforce. • Initiate development of Vandenberg AFB Test capabilities and ensure Western Range Test capabilities for the Flight Test Program. <p><i>FY 2021 Plans:</i></p> <ul style="list-style-type: none"> • 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. • 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. • Continue to examine and mature air vehicle equipment, command and 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 weapon system and non-operational software, software integration and development, modular system architecture requirements, and product life-cycle management. • 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 execute and improve the unified certification strategy which meets nuclear surety, cyber security, and nuclear safety requirements. • 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. • Continue to refine Security Classification Guide, update impacts, and implement updates and changes through all Government and contractor programmatic activities. 			

UNCLASSIFIED

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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
<ul style="list-style-type: none"> • Continue to increase FFRDC/UARC support to maintain the ability to own the technical baseline in EMD. • Plan and execute critical software risk reduction activities. • Increase expansion of 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. • Develop Vandenberg AFB Test capabilities and ensure Western Range Test capabilities for the Flight Test Program. • Continue integrating requirement for dual-capable, air-based, survivable launch capability. • Integrate the Mk-21A Reentry Vehicle (Program 0101328F), ICBM Fuze Modernization (Program 0604933F), and GBSD test programs. • Expand government-owned and government-operated DevSecOps/software stack. <p>FY 2020 to FY 2021 Increase/Decrease Statement: Funds increased due to ramp up of EMD activities in Fiscal Year 2021.</p>				
Accomplishments/Planned Programs Subtotals		401.244	470.373	1,524.759
		FY 2019	FY 2020	
Congressional Add: Congressional Add- Risk Reduction		0.000	65.100	
FY 2019 Accomplishments: N/A				
FY 2020 Plans: <ul style="list-style-type: none"> • Develop digital software factory to reduce software development risk • Develop GBSD Cloud Infrastructure and initiating DevSecOps deployment • Initiate environmental impact studies • Continue to grow the organization in preparation for EMD • Install critical SAP IT infrastructure to protect nuclear program data • Initiate EMD risk reduction activities, to include Guidance Component Life Testing, Booster Ground Testing, and additional Modeling & Simulation activities 				
Congressional Add: Congressional Directed Transfer- SLP-A		0.000	22.022	
FY 2019 Accomplishments: N/A				
FY 2020 Plans: <ul style="list-style-type: none"> • Integrate requirement for dual-capable, air-based, survivable launch capability from the Airborne Launch Control System-Replacement (ALCS-R) program, previously budgeted in Program 0101213F, Project 672983. 				
Congressional Adds Subtotals		0.000	87.122	

UNCLASSIFIED

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

<u>Line Item</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u> <u>Base</u>	<u>FY 2021</u> <u>OCO</u>	<u>FY 2021</u> <u>Total</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• RDTE 04 PE 0603851F: <i>Intercontinental Ballistic Missile - Dem/Val</i>	24.994	30.969	32.959	-	32.959	55.370	56.088	7.358	7.493	Continuing	Continuing
• MILCON PE 0101233F: <i>GBSD SQUADRONS</i>	0.000	40.000	79.200	-	79.200	214.000	102.400	44.500	75.795	162.315	718.210

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 Fiscal Year 2029. For the EMD phase of this strategy, the Program Office will award an EMD contract in 4QFY20. 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 model-based systems engineering (MBSE)/digital engineering to streamline system development activities and time-lines; 4) align contract incentives to mitigate schedule and performance risk; 5) utilize MBSE processes and tools to create schedule margin and pull surety, safety, cyber, and test activities to the left for time certain delivery; 6) ensure government owns key interfaces and data rights; 7) pursue "smart commonality" with Navy, Space, and Missile Defense Agency. The EMD phase will include 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 will culminate with early production and weapon system deployment. The program will also assess the cost and schedule risks associated with every requirement. The period of performance for the EMD contract is 4QFY20 to 2QFY28 with 5 option years for early production and deployment. These efforts will ultimately extend the capabilities of the ground-based leg of the nuclear triad through 2075.

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force											Date: February 2020				
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 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
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	110.196	115.789	Oct 2018	9.100	Oct 2019	-		-		-	0.000	235.085	349.160
GBSD TMRR Contractor #2	C/CPFF	Northrup Grumman Sys Corp : El Segundo, CA	129.882	110.315	Oct 2018	88.388	Oct 2019	-		-		-	0.000	328.585	328.585
GBSD EMD Contract	C/CPIF	TBD : TBD	0.000	-		108.668	Aug 2020	1,231.915	Oct 2020	-		1,231.915	14,465.328	15,805.911	-
GBSD Security Classification Guide Compliance	Various	Various : Various	0.000	23.066	Oct 2018	62.018	Oct 2019	-		-		-	0.000	85.084	86.393
Subtotal			240.078	249.170		268.174		1,231.915		-		1,231.915	14,465.328	16,454.665	N/A

Remarks

EMD award projected for fourth quarter FY20; increase in FY21 represents an entire year funding requirement.

Support (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
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	76.313	29.731	Oct 2018	36.824	Oct 2019	35.489	Oct 2020	-		35.489	188.918	367.275	-
GBSD Electronic Parts Strategy and Commonality	MIPR	Naval Surface Warfare Center Crane : Crane, IN	8.977	4.427	Nov 2018	4.000	Nov 2019	4.900	Nov 2020	-		4.900	10.738	33.042	-
GBSD System Engineering and Acquisition Support	MIPR	Aerospace Corporation : El Segundo, CA	8.224	6.404	Nov 2018	6.318	Nov 2019	6.508	Nov 2020	-		6.508	38.489	65.943	-
GBSD Acquisition Support and System Engineering	MIPR	MITRE : Bedford, MA	9.896	6.922	Nov 2018	11.208	Nov 2019	12.000	Nov 2020	-		12.000	50.231	90.257	-
GBSD Technical Area Task Support (TMRR)	MIPR	Air Force Global Strike Command : Barksdale AFB, LA	2.950	-		-		-		-		-	0.000	2.950	-

UNCLASSIFIED

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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>
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Support (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
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	2.352	Nov 2020	-		2.352	12.492	19.247	-
GBSD Reentry Systems (RS) FFRDC Support and Analysis	MIPR	Sandia National Laboratories : Various	12.313	6.473	Oct 2018	7.750	Oct 2019	7.750	Oct 2020	-		7.750	35.831	70.117	-
GBSD RS FFRDC Analysis and Acquisition Intelligence Support	MIPR	MIT Lincoln Labs : Lexington, MA	1.427	1.435	Oct 2018	1.026	Oct 2019	0.150	Oct 2020	-		0.150	28.316	32.354	-
GBSD Operations Research Analyst Support	C/FFP	Tecolote Research : Hill AFB, UT	0.239	2.118	Oct 2018	2.230	Oct 2019	3.215	Oct 2020	-		3.215	14.199	22.001	-
GBSD Surety and Certification Engineering Services	C/CPFF	Booz Allen Hamilton : Kirtland AFB, NM	4.251	2.145	Nov 2018	2.720	Nov 2019	3.000	Nov 2020	-		3.000	0.000	12.116	-
GBSD OASIS A&AS Support	C/FPIF	Peerless : Hill AFB, UT	0.012	-		1.144	Nov 2019	-		-		-	0.000	1.156	-
GBSD Technical Design Agent for NC2 Codes/ Crypto	MIPR	Sandia National Labs : Various	0.000	-		8.000	Nov 2019	8.000	Nov 2020	-		8.000	0.000	16.000	-
GBSD Mantech	MIPR	Various : Various	0.000	2.463	Dec 2018	3.525	Dec 2019	7.000	Dec 2020	-		7.000	0.000	12.988	-
GBSD Civilian Manpower	Various	US Gov Civilians : Hill AFB, UT	0.000	6.512	Dec 2018	16.517	Oct 2019	21.360	Oct 2020	-		21.360	0.000	44.389	-
GBSD NEPA Analysis	MIPR	Various : Various	0.000	0.487	Apr 2019	6.700	Apr 2020	3.513	Oct 2020	-		3.513	0.000	10.700	-
GBSD Environment Assessments	MIPR	Various : Various	0.000	-		4.623	Dec 2019	4.365	Dec 2020	-		4.365	0.000	8.988	-
GBSD Enterprise Support	C/Various	Various : Various	0.681	0.021	Oct 2018	0.050	Oct 2019	0.718	Oct 2020	-		0.718	880.885	882.355	-
Subtotal			126.884	70.538		114.037		120.320		-		120.320	1,260.099	1,691.878	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 thus increasing costs within Cost Category Items.
 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).
 GBSD Civilian Manpower increases due to increased DCA allocations in order to support EMD and are in addition to any other planned civilian hiring.

UNCLASSIFIED

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Support (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
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 Civilian Manpower & GBSD Environment Assessments moved from Management Services to Support category as these efforts are not PMA.

Test and Evaluation (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
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 Cybersecurity, Test and Evaluation Framework, Codes/Crypto	MIPR	Johns Hopkins University-Applied Physics Lab : Laurel, MD	12.150	12.600	Oct 2018	13.200	Oct 2019	14.870	Oct 2020	-		14.870	65.463	118.283	-
GBSD Integrated Test Team	PO	Arnold Engineering Development Complex : Arnold AFB, TN	5.125	3.861	Oct 2018	7.462	Oct 2019	20.983	Oct 2020	-		20.983	258.250	295.681	-
GBSD Independent Operational Test Agency	PO	Air Force Operational Test and Evaluation Center : Hill AFB, UT	1.275	1.188	Oct 2018	1.990	Oct 2019	5.756	Oct 2020	-		5.756	209.131	219.340	-
GBSD Integrated Threat Analysis and Simulation Environment (ITASE) 1	MIPR	DIA-Missile and Space Intelligence Center : Redstone Arsenal, AL	4.682	4.779	Oct 2018	5.144	Nov 2019	5.300	Nov 2020	-		5.300	0.000	19.905	-
GBSD ITASE 2	MIPR	National Air and Space Intelligence Center : Fairborn, OH	0.942	-		0.765	Nov 2019	-		-		-	0.000	1.707	-
GBSD Nuclear Dust and Debris Environments Study	MIPR	Air Force Research Lab : Wright Patterson AFB, OH	1.084	1.200	Oct 2018	0.400	Nov 2019	-		-		-	0.000	2.684	-
GBSD RS Test and Advanced Technology Interface (TMRR)	MIPR	Sandia National Labs : Various	1.950	0.274	Oct 2018	-		-		-		-	0.000	2.224	-
GBSD Defense Accelerator (TMRR)	MIPR	Army Research Lab : Adelphi, MD	1.282	0.213	Dec 2018	-		-		-		-	0.000	1.495	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force **Date:** February 2020

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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Test and Evaluation (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
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 Launch Systems LF-26 (TMRR)	Various	Various : Various	0.010	0.030	Jan 2019	3.010	Oct 2019	-		-		-	0.000	3.050	-
GBSD Software Support	PO	309th SMXG : Hill AFB, UT	1.379	4.100	Oct 2018	8.970	Oct 2019	10.000	Oct 2020	-		10.000	631.687	656.136	-
GBSD Test Vehicles	Various	Various : Various	0.000	-		15.300	Jan 2020	11.000	Jan 2021	-		11.000	123.000	149.300	-
GBSD Instrument Testing	MIPR	Aerospace Corporation : El Segundo, CA	0.000	2.000	Aug 2019	7.600	Nov 2019	-		-		-	0.000	9.600	-
GBSD Booster Ground Test	MIPR	Air Force Research Labs : Edwards AFB, CA	0.000	-		7.700	Nov 2019	8.800	Nov 2020	-		8.800	0.000	16.500	-
GBSD Guidance, Navigation, and Control Instruments for Developmental Testing	MIPR	Various : Various	0.000	-		21.600	Oct 2019	-		-		-	0.000	21.600	-
GBSD / Missile Defense Agency Silo Fly-out Modelling / Simulation Development	MIPR	Various : Various	0.000	0.900	Aug 2019	5.500	Nov 2019	4.300	Nov 2020	-		4.300	0.000	10.700	-
GBSD Reentry System / Reentry Vehicle Modelling / Simulation Environment Development	MIPR	National Air and Space Intelligence Center : Fairborn, OH	0.000	0.857	Aug 2019	2.000	Nov 2019	0.895	Nov 2020	-		0.895	0.000	3.752	-
GBSD Enterprise Test and Assessments	C/Various	Various : Various	3.546	-		-		-		-		-	1,603.571	1,607.117	-
GBSD Rapid Assessment Technology / LS Support	MIPR	Various : Various	0.000	0.270	Apr 2019	3.506	Apr 2020	1.000	Mar 2021	-		1.000	0.000	4.776	-
GBSD Joint Test Assembly Encryption	MIPR	Sandia National Labs : Various	0.000	1.500	Jul 2019	3.000	Nov 2019	6.000	Dec 2020	-		6.000	0.000	10.500	-
GBSD Joint Environment Test Unit / Joint Test Assembly National Nuclear Security Agency Cost Share	MIPR	Sandia National Labs : Various	0.000	1.500	Mar 2019	2.000	Nov 2019	5.000	Dec 2020	-		5.000	0.000	8.500	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force **Date:** February 2020

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>
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Test and Evaluation (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
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			33.425	35.272		109.147		93.904		-		93.904	2,891.102	3,162.850	N/A

Remarks
 GBSD Cybersecurity, Test and Evaluation Framework, Codes/Crypto will continue into EMD.
 GBSD Integrated Test Team will continue to increase Full Time Equivalent (FTE) allocations as GBSD ramps up for EMD.
 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 Joint Test Assembly Encryption & GBSD Joint Environment Test/Unit/Joint Test Assembly National Nuclear Security Agency Cost Share moved from Support to Test and Evaluation category.
 GBSD Software Support will continue to increase 309th FTE allocations as GBSD ramps up for EMD
 GBSD Software Support and GBSD Integrated Test Team total cost increased as requirements have been refined to reflect updated EMD estimate.

Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
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	5.138	7.665	Oct 2018	4.139	Oct 2019	2.255	Oct 2020	-		2.255	66.671	85.868	-
GBSD Integration Support Contract	C/FFP	BAE : Hill AFB, UT	42.939	16.949	Oct 2018	19.828	Oct 2019	19.110	Nov 2020	-		19.110	0.000	98.826	-
GBSD Electronics Parts Strategy and Commonality	C/Various	Naval Surface Warfare Center : Crane, IN	3.847	1.898	Nov 2018	1.000	Nov 2019	2.100	Nov 2020	-		2.100	1.602	10.447	-
GBSD System Engineering and Acquisition Support	C/Various	Aerospace Corporation : El Segundo, CA	10.052	7.828	Nov 2018	7.722	Nov 2019	7.954	Nov 2020	-		7.954	24.460	58.016	-
GBSD IS/IT Support	C/Various	Various : Various	11.806	10.654	Dec 2018	10.761	Oct 2019	4.201	Oct 2020	-		4.201	16.518	53.940	-
GBSD DevSecOps	MIPR	Various : Various	0.000	0.270	Sep 2019	22.687		43.000	Nov 2020	-		43.000	0.000	65.957	-
GBSD Enterprise Infrastructure	C/Various	Various : Various	0.000	1.000	Oct 2018	-		-		-		-	277.282	278.282	-
Subtotal			73.782	46.264		66.137		78.620		-		78.620	386.533	651.336	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force **Date:** February 2020

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>
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Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
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
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.

	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	474.169	401.244	557.495	1,524.759	-	1,524.759	19,003.062	21,960.729	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force		Date: February 2020
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 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
	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																												
9th Quarter Technical Interchange Meeting																												
Software Specification Review																												
Preliminary Design Review (Apr 2020)																												
Milestone B (Aug 2020)																												
EMD Phase																												
Nuclear Safety Design Certification																												
Nuclear Compatibility Certification																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
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	2019	4	2020
9th Quarter Technical Interchange Meeting	1	2020	1	2020
Software Specification Review	2	2020	2	2020
Preliminary Design Review (Apr 2020)	3	2020	3	2020
Milestone B (Aug 2020)	4	2020	4	2020
EMD Phase	4	2020	4	2025
Nuclear Safety Design Certification	1	2021	4	2025
Nuclear Compatibility Certification	1	2021	4	2025