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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 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 0101213F / <i>Minuteman Squadrons</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	156.800	185.640	104.219	116.569	0.000	116.569	116.618	23.854	0.000	0.000	Continuing	Continuing
672983: <i>MM Ground and Comm Equipment</i>	0.000	63.388	69.251	15.879	0.000	15.879	18.609	4.387	0.000	0.000	Continuing	Continuing
672984: <i>MM III Baseline Support</i>	0.000	90.606	14.816	96.246	0.000	96.246	94.265	13.153	0.000	0.000	Continuing	Continuing
672985: <i>MM Support Equip</i>	0.000	11.160	6.859	0.000	0.000	0.000	0.000	3.196	0.000	0.000	Continuing	Continuing
672986: <i>MM Crypto Mods</i>	156.800	20.486	13.293	4.444	0.000	4.444	3.744	3.118	0.000	0.000	0.000	201.885

Note

This program, BA 7, PE 0101213F, project 672983, LGM-30G Airborne Procedures Trainer Replacement (APT-R), is a new start.

In FY 2019, Project 672983, MM Ground and Comm Equipment - LGM-30G Air Launch Control System Replacement (ALCS-R) was terminated and efforts were transferred to Program 0605230F, Ground Based Strategic Deterrent, and LGM-30G Automatic Switching Unit (ASU) was completed.

In FY 2020, Project 672983, MM Ground and Comm Equipment - LGM-30G Launch Control Center Break-In-Kit (LCCB), LGM-30G Launch Control Center Block Upgrade (LCCBU), and LGM-30G Remove Visual Assessment Phase II (RVA II) were completed.

In FY 2019, Project 672985, MM Support Equip - LGM-30G Transporter Erector Replacement Program (TERP), LGM-30G Payload Transporter Replacement (PTR), and LGM-30G Performance Assessment Data System Communications Equipment Interface Unit (PADS CEIU) were completed.

A. Mission Description and Budget Item Justification

The MM Ground and Comm Equipment program replaces obsolete/unsupportable ground-based weapon system equipment located at Launch Control Centers (LCCs) and Launch Facilities (LFs) necessary to continue Minuteman III (MM III) operations through 2030. Current efforts include development, qualification, integration, and testing of replacement equipment such as the LGM-30G Automatic Switching Unit (ASU), LGM-30G Fast Rising B-Plug Service Life Extension Program (FRBP SLEP), LGM-30G Launch Control Center Break-In-Kit (LCCB), LGM-30G Launch Control Center Block Upgrade (LCCBU), and LGM-30G Remote Visual Assessment II (RVA II), and LGM-30G Airborne Procedures Trainer Replacement (APT-R).

MM III Baseline Support program replaces or upgrades obsolete/unsupportable flight test unique equipment installed on the missile during flight test, used to test MM III systems on the ground, or located at test facilities to collect, process, and analyze test data. Flight test equipment supports test and evaluation of MM III capabilities, and MM III Operational Test Launches (OTLs) to determine ICBM force readiness, reliability and capability shortfalls. Efforts include development, qualification, integration and testing of replacement equipment such as LGM-30G Arm/Disarm Switch Replacement (ADSR) and LGM-30G Flight Test Telemetry and Termination System (FT3). These programs will also implement processes, procedures and data systems to mitigate the transition risk from MM III to GBSD. As other similar equipment is identified for replacement, it will be added to this program. MM III Baseline Support also provides for other MM III unique government costs, studies of system performance, contract closeout costs, cost trades and acquisition planning activities, up to and including proposal preparation, for future capabilities. Efforts also include any minor needs required to prepare for full acquisition purposes.

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MM Support Equipment program designs, develops, and tests replacement of obsolete/non-serviceable weapon system support equipment. These programs will also implement processes, procedures and data systems to mitigate the transition risk from MM III to Ground Based Strategic Deterrent (GBSD). Current efforts include design, development, and testing of support equipment such as LGM-30G Control Monitor Procedure Trainer Upgrade (CMPT), LGM-30G Transporter Erector Replacement Program (TERP), LGM-30G Payload Transporter Replacement (PTR), LGM-30G Performance Assessment Data System Communications Equipment Interface Unit (PADS CEIU), and LGM-30G Pendulous Integrating Gyroscopic Accelerometer/G6B4 Build Equipment Replacement (PIGA/G6B4 BER). Programs may execute DMS/PMA support through the ISC 2.0 contract established to support the ICBM enterprise through the life of MMIII.

MM Crypto Mods executes USSTRATCOM, Air Force Global Strike Command, and Air Force Safety Center requirements by implementing the KS-60 capabilities in LGM-30G ICBM Cryptography Upgrade II (ICU II) of remote key/code change and irreversible transformation as mandated in the approved Capabilities Development Document (dated 4 Jan 05) and addresses Nuclear Weapon System Safety Group Operational Safety Review requirements 98-2, 00-1 and 02-2. It also incorporates continuous signal lockout capabilities to prevent the widespread loss of status monitoring. These features will greatly increase security during code changes by reducing the frequency of open sites 75 days annually and will reduce associated resource costs for 450 Launch Facilities (LFs) and 45 Launch Control Centers (LCCs).

This program element may include necessary civilian pay expenses required to manage, execute, and deliver Minuteman Squadrons nuclear weapon system capabilities. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605831F or 0605833F.

This program is in Budget Activity 7, Operational System Development because this budget activity includes development efforts to upgrade systems that have been fielded or have received approval for full rate production and anticipate production funding in the current or subsequent fiscal year.

B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	154.733	128.961	133.978	0.000	133.978
Current President's Budget	185.640	104.219	116.569	0.000	116.569
Total Adjustments	30.907	-24.742	-17.409	0.000	-17.409
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	-2.720			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	-22.022			
• Reprogrammings	35.986	0.000			
• SBIR/STTR Transfer	-5.041	0.000			
• Other Adjustments	-0.038	0.000	-17.409	0.000	-17.409

Change Summary Explanation

FY2019 funding reflects a Congressionally-approved reprogramming of \$26.460 million and a below threshold reprogramming of \$9.526 million for Flight Test Telemetry and Termination.

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<p>FY2019 funding reflects a Small Business Innovation Research (SBIR) adjustment of \$5.041 million. FY2020 funding reflects a Congressional directed reduction of \$2.720 million for "Maintain program affordability: Launch Control Center Block Upgrade excess to need" and a \$22.022 million Congressional Directed Transfer to Ground Based Strategic Deterrent (Program Element 0605230F). FY2021 adjustments due to higher AF Nuclear priorities.</p>		

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force										Date: February 2020		
Appropriation/Budget Activity 3600 / 7					R-1 Program Element (Number/Name) PE 0101213F / <i>Minuteman Squadrons</i>				Project (Number/Name) 672983 / <i>MM Ground and Comm Equipment</i>			
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
672983: <i>MM Ground and Comm Equipment</i>	0.000	63.388	69.251	15.879	0.000	15.879	18.609	4.387	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This program, BA 7, PE 0101213F, project 672983, LGM-30G Airborne Procedures Trainer Replacement (APT-R), is a new start.

In FY 2019, Project 672983, MM Ground and Comm Equipment - LGM-30G Air Launch Control System Replacement (ALCS-R) was terminated and efforts were transferred to Program 0605230F, Ground Based Strategic Deterrent, and LGM-30G Automatic Switching Unit (ASU) was completed.

In FY 2020, Project 672983, MM Ground and Comm Equipment - LGM-30G Launch Control Center Break-In-Kit (LCCB), LGM-30G Launch Control Center Block Upgrade (LCCBU), and LGM-30G Remove Visual Assessment II (RVA II) were completed.

A. Mission Description and Budget Item Justification

The MM Ground and Comm Equipment program replaces obsolete/unsupportable ground-based weapon system equipment located at Launch Control Centers (LCCs) and Launch Facilities (LFs) necessary to continue MM III operations through 2030. Current efforts include development, qualification, integration, and testing of replacement equipment such as the LGM-30G Automatic Switching Unit (ASU), LGM-30G Fast Rising B-Plug Service Life Extension Program (FRBP SLEP), LGM-30G Launch Control Center Break-In-Kit (LCCB), LGM-30G Launch Control Center Block Upgrade (LCCBU), LGM-30G Remote Visual Assessment II (RVA II), and LGM-30G Airborne Procedures Trainer Replacement (APT-R).

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

	FY 2019	FY 2020	FY 2021
Title: LGM-30G Air Launch Control System Replacement (ALCS-R)	43.677	64.595	0.000
<p>Description: In FY 2019, Project 672983, MM Ground and Comm Equipment - Air Launch Control System Replacement (ALCS-R) was terminated. The requirement for air-based, survivable launch capability will be fulfilled through an alternative path: a dual-capable Secondary Launch Platform - Airborne, under the Ground Based Strategic Deterrent (GBSD) program. The GBSD program is budgeted in PE 0605230F, Ground Based Strategic Deterrent.</p> <p>The purpose of the ALCS-R program was to design, develop, produce and deploy a replacement for the legacy nuclear command and control system that provides the capability to launch Intercontinental Ballistic Missiles from an airborne platform, currently the Navy E-6B, as well as consider future alternate launch requirements. The legacy system consists of a nuclear hardened radio and MM III interface at each Launch Facility, and a suite of launch and cryptographic equipment that generates and transmits commands from the E-6B. ALCS dependent on the Strategic Air Command Code Processing System for codes data supplied to airborne equipment, and the Navy E-6B radio Command, Control, and Communication data path to transmit signals to the Launch Facilities.</p>			

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Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 0101213F / <i>Minuteman Squadrons</i>	Project (Number/Name) 672983 / <i>MM Ground and Comm Equipment</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
<p><i>FY 2020 Plans:</i></p> <ul style="list-style-type: none"> • Complete ALCS-R program termination and transition of the requirement for an air-based, survivable launch capability to the GBSD program. <p><i>FY 2021 Plans:</i></p> <ul style="list-style-type: none"> • N/A - Program Terminated <p><i>FY 2020 to FY 2021 Increase/Decrease Statement:</i> Funding decreased due to program termination and transition of the requirement to GBSD program.</p>				
<p><i>Title:</i> LGM-30G Automatic Switching Unit (ASU)</p> <p><i>Description:</i> The ASU program will replace the current Minuteman ASU, Diesel Electric Unit (DEU) and Minuteman Power Processor (MPP). The ASU is controlled by the MPP, which contains software and electronics to measure incoming and standby power characteristics. The DEU provides standby power in the event of a loss of the primary power source. Current equipment and lack of repair/reprogram capability causes inadvertent source transfers by the MPP. Technical data does not exist for repair or reprogramming of the MPP making it unsupportable. The ASU contacts have exceeded their service life, and unnecessary source transfers stress mission critical components. The increased power transfers have increased the use and accelerated the wear on the DEU.</p> <p><i>FY 2020 Plans:</i> N/A</p> <p><i>FY 2021 Plans:</i> N/A</p> <p><i>FY 2020 to FY 2021 Increase/Decrease Statement:</i> N/A</p>		2.691	0.000	0.000
<p><i>Title:</i> LGM-30G Fast Rising B-Plug Service Life Extension Program (FRBP SLEP)</p> <p><i>Description:</i> The Fast Rising B-Plug (FRBP) provides security functions for the Personnel Access System (PAS) of the Launch Facilities (LFs). It is a 14,000 pound cylinder with 12 locking pins used to deny/delay access to intruders during LF maintenance activities.</p> <p>This effort includes critical hardware and software modifications to address high obsolescence risk and reliability issues affecting the operational wings.</p> <p><i>FY 2020 Plans:</i></p>		0.000	4.656	12.455

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
<ul style="list-style-type: none"> • Release Requests For Proposal • Perform Source Selection • Award Engineering Manufacturing Development and Independent Verification & Validation contracts • Complete system functional and requirements reviews • Test and Evaluations Planning <p>FY 2021 Plans:</p> <ul style="list-style-type: none"> • Preliminary Design Review • Critical Design Review • Test & Evaluation execution <p>FY 2020 to FY 2021 Increase/Decrease Statement: Funding increased due ramp up in EMD activities.</p>				
<p>Title: LGM-30G Launch Control Center Break-In-Kit (LCCB)</p> <p>Description: The LCCB program developed a kit that enables personnel to extract incapacitated missile combat crew members in the event the LCC crew becomes unresponsive and cannot open the LCC Blast Door. The LCCB is a new capability and has not been previously fielded.</p> <p>FY 2020 Plans: N/A</p> <p>FY 2021 Plans: N/A</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: N/A</p>		0.830	0.000	0.000
<p>Title: Launch Control Center (LCC) Block Upgrade (LCCBU)</p> <p>Description: The LCCBU program addressed several elements within the LCC experiencing supportability issues. Each component will be procured once development has been completed and installed at each LCC based on availability. It consists of a Journal Memory Loader (JML), Flash Data Drive (FDD), Weapon System Control Console (WSSC) Printer, Oxygen Regeneration Unit (ORU), and associated Trainers and Support Equipment.</p> <p>All LCCBU efforts support 45 operational LCCs, 12 trainers, 2 Integration Facilities, 2 Test Launch Facilities, and additional support and test equipment for maintenance locations.</p> <p>FY 2020 Plans:</p>		9.887	0.000	0.000

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
N/A				
FY 2021 Plans: N/A				
FY 2020 to FY 2021 Increase/Decrease Statement: N/A				
Title: LGM-30G Remote Visual Assessment II (RVA II)		6.303	0.000	0.000
Description: RVA II provides enhanced situational awareness by providing the current remote camera feed to responding security vehicles and helicopters. RVA II also increases backup power to current remote visual equipment, increases video archival storage, and implements auto-activation of outer and inner zone alarms. RVA II also implements changes required to meet DoD CyberSecurity requirements.				
FY 2020 Plans: N/A				
FY 2021 Plans: N/A				
FY 2020 to FY 2021 Increase/Decrease Statement: N/A				
Title: LGM-30G Airborne Procedures Trainer Replacement (APT-R)		-	0.000	3.424
Description: The Airborne Procedures Trainer- Replacement (APT-R) will replace a one-of-a-kind simulator located at Offutt AFB NE that was destroyed by the March 2019 flood. APT-R program will design, develop, produce, and deploy a trainer used to certify the Airborne Launch Control System (ALCS) crews on missile launch procedures, emergencies, malfunctions, and in-flight operations as well as Nuclear Certification training.				
APT-R program will use spiral development off of the temporary training solution Virtual APT, which was awarded in October 2019. The development effort will upgrade the temporary solution to a certified system with an improved realistic training environment. The increased capability will include configuring APT-R as a Class 1 training device, incorporating tactile functionality, designing realistic E-6B Mercury aircraft enclosure, developing audio buffer, and augmentation of the instructor touch panel.				
FY 2020 Plans:				

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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
N/A			
<i>FY 2021 Plans:</i>			
• Enter acquisition process			
• Release Request for Proposals			
• Mature APT-R trainer solution			
• Develop test plan			
<i>FY 2020 to FY 2021 Increase/Decrease Statement:</i>			
Funding increased due to start of development efforts.			
Accomplishments/Planned Programs Subtotals	63.388	69.251	15.879

C. 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>
• MPAF 03 Line Item M30MLG: <i>Minuteman III Modifications BP21</i>	38.290	21.060	53.274	-	53.274	81.393	78.542	28.037	18.000	Continuing	Continuing
• MPAF 01 Ballistic Missiles/ BSA 3...: <i>Minuteman III</i> <i>Replacement Eq-Ballistic BP22</i>	0.000	0.100	0.000	-	0.000	0.000	0.000	0.000	-	Continuing	Continuing
• MPAF 04 Line Item 000999: <i>Replen Spares/</i> <i>Repair Parts BP25/26</i>	0.000	0.000	17.843	-	17.843	18.013	13.900	10.707	0.000	Continuing	Continuing

Remarks

D. Acquisition Strategy

Ground and Communication equipment replacement efforts are reviewed to determine the best method for execution, including vendor qualification and procurement with no development required, develop and/or modification with organic depot capabilities or development with industry. Industry development for Ground and Communication equipment efforts will be executed through contracts available under the Future ICBM Sustainment and Acquisition Construct (FISAC) or competitive source selections. Nuclear Surety Cross Check Analysis (NSCCA) and Independent Verification and Validation (IV&V) efforts are contracted separately. Nuclear Surety and Vulnerability analysis requirements are covered in the Acquisition Strategy.

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

Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 0101213F / Minuteman Squadrons	Project (Number/Name) 672983 / MM Ground and Comm Equipment
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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			
LGM-30G Airborne Launch Control System Replacement (ALCS-R) TMRR Contractor A	C/FPIF	Lockheed Martin : Littleton, CO	0.000	17.088	Oct 2018	24.212	Dec 2019	-		-		-	0.000	41.300	-
LGM-30G Airborne Launch Control System Replacement (ALCS-R) TMRR Contractor B	C/FPIF	Rockwell Collins : Cedar Rapids, IA	0.000	13.260	Oct 2018	26.766	Dec 2019	-		-		-	0.000	40.026	0.000
LGM-30G Airborne Launch Control System Replacement (ALCS-R) SIL	MIPR	Aerospace : El Segundo, CA	0.000	-		0.100	May 2020	-		-		-	0.000	0.100	0.000
LGM-30G Automatic Switching Unit (ASU) EMD	C/CPIF	Northrop Grumman : Salt Lake City, UT	0.000	2.251	Dec 2018	-		-		-		-	0.000	2.251	14.411
LGM-30G Fast Rising B-Plug Service Life Extension Program (FRBP SLEP) EMD	C/CPIF	Northrop Grumman : Salt Lake City, UT	0.000	0.000		3.270	May 2020	9.992	May 2021	-		9.992	Continuing	Continuing	-
LGM-30G Launch Control Center Break-In-Kit EMD	MIPR	Navy Crane : Crane, IN	0.000	0.300	Apr 2019	-		-		-		-	Continuing	Continuing	-
LGM-30G Launch Control Center Block Upgrade EMD	C/CPIF	Northrop Grumman : Salt Lake City, UT	0.000	7.658	Oct 2018	-		-		-		-	Continuing	Continuing	-
LGM-30G Remote Visual Assessment Phase II (RVA II) EMD	C/CPFF	Sentry View Systems : Melbourne, FL	0.000	4.044	Jan 2019	-		-		-		-	Continuing	Continuing	0.000
LGM-30G Remote Visual Assessment Phase II (RVA II) EMD Other Development	Various	Various : Various	0.000	0.755	Jan 2019	-		-		-		-	Continuing	Continuing	0.000
LGM-30G Airborne Procedures Trainer Replacement (APT-R)	TBD	Various : Various	0.000	-		-		3.000	Jan 2021	-		3.000	Continuing	Continuing	-
Subtotal			0.000	45.356		54.348		12.992		-		12.992	Continuing	Continuing	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 / 7	R-1 Program Element (Number/Name) PE 0101213F / Minuteman Squadrons	Project (Number/Name) 672983 / MM Ground and Comm Equipment
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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			
LGM-30G Airborne Launch Control System Replacement (ALCS-R) MITRE	MIPR	MITRE : Bedford, MA	0.000	2.742	Oct 2018	-		-		-		-	0.000	2.742	0.000
LGM-30G Airborne Launch Control System Replacement (ALCS-R) Aerospace	MIPR	Aerospace Corporation : El Segundo, CA	0.000	2.568	Oct 2018	-		-		-		-	0.000	2.568	0.000
LGM-30G Airborne Launch Control System Replacement (ALCS-R) Navy Crane	MIPR	Naval Surface War Ctr : Crane, IN	0.000	0.002	Feb 2019	-		-		-		-	0.000	0.002	0.000
LGM-30G Airborne Launch Control System Replacement (ALCS-R) Design Support	Various	Various : Various	0.000	1.656	Oct 2018	-		-		-		-	0.000	1.656	0.000
LGM-30G Launch Control Center Break-In-Kit Test Support	Various	Various : Various	0.000	0.018	Sep 2019	-		-		-		-	Continuing	Continuing	-
Subtotal			0.000	6.986		-		-		-		-	Continuing	Continuing	N/A

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			
LGM-30G Airborne Launch Control System Replacement (ALCS-R) Testing	Various	Various : Various	0.000	0.552	Dec 2018	1.546	Dec 2019	-		-		-	0.000	2.098	0.000
LGM-30G Fast Rising B-Plug Service Life Extension Program (FRBP SLEP) Test & Evaluation	Various	Various : Various	0.000	-		0.182	Oct 2019	0.608	Oct 2020	-		0.608	Continuing	Continuing	-

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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			
LGM-30G Launch Control Center Break-In-Kit Test Repair	PO	Naval Surface Warfare Ctr : Crane, IN	0.000	0.174	Apr 2019	-		-		-		-	Continuing	Continuing	-
LGM-30G Launch Control Center Block Upgrade Test & Evaluation	Various	Various : Various	0.000	1.366	Oct 2018	-		-		-		-	Continuing	Continuing	0.000
LGM-30G Remote Visual Assessment II (RVA II) Test & Evaluation	Various	Various : Various	0.000	-		-		-		-		-	Continuing	Continuing	0.000
Subtotal			0.000	2.092		1.728		0.608		-		0.608	Continuing	Continuing	N/A

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			
LGM-30G Airborne Launch Control System Replacement (ALCS-R) Integration Support Contract	C/FP	BAE : Layton, UT	0.000	3.661	Oct 2018	4.414	Oct 2019	-		-		-	0.000	8.075	0.000
LGM-30G Airborne Launch Control System Replacement (ALCS-R) A&AS	C/FPIF	Peerless Technologies : Fairborn, OH	0.000	0.705	Oct 2018	2.214	Oct 2019	-		-		-	0.000	2.919	0.000
LGM-30G Airborne Launch Control System Replacement (ALCS-R) PMA	Various	Various : Various	0.000	1.443	Oct 2018	5.343	Oct 2019	-		-		-	0.000	6.786	0.000
LGM-30G Automatic Switching Unit (ASU) PMA	Various	Various : Various	0.000	0.028	Oct 2018	-		-		-		-	0.000	0.028	0.000
LGM-30G Automatic Switching Unit (ASU) A&AS	C/FP	BAE : Layton, UT	0.000	0.412	Oct 2018	-		-		-		-	0.000	0.412	0.000

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

Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 0101213F / Minuteman Squadrons	Project (Number/Name) 672983 / MM Ground and Comm Equipment
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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			
LGM-30G Launch Control Center Break-In-Kit PMA	Various	Various : Various	0.000	0.149	Feb 2019	-		-		-		-	Continuing	Continuing	0.000
LGM-30G Launch Control Center Break-In-Kit A&AS	C/FP	BAE : Layton, UT	0.000	0.189	Nov 2018	-		-		-		-	Continuing	Continuing	-
LGM-30G Launch Control Center Block Upgrade PMA	Various	Various : Various	0.000	0.015	Jul 2019	-		-		-		-	Continuing	Continuing	-
LGM-30G Launch Control Center Block Upgrade A&AS	C/FP	BAE : Layton, UT	0.000	0.848	Nov 2018	-		-		-		-	Continuing	Continuing	-
LGM-30G Fast Rising B-Plug Service Life Extension Program (FRBP SLEP) A&AS	C/FP	BAE : Layton, UT	0.000	-		0.654	Feb 2020	0.736	Feb 2021	-		0.736	Continuing	Continuing	0.000
LGM-30G Fast Rising B-Plug Service Life Extension Program (FRBP SLEP) PMA	Various	Various : Various	0.000	-		0.550	Dec 2019	1.119	Dec 2020	-		1.119	Continuing	Continuing	-
LGM-30G Remote Visual Assessment Phase II (RVA II) PMA	Various	Various : Various	0.000	0.071	Oct 2018	-		-		-		-	Continuing	Continuing	0.000
LGM-30G Remote Visual Assessment Phase II (RVA II) A&AS	C/FP	BAE : Layton, UT	0.000	1.433	Oct 2018	-		-		-		-	Continuing	Continuing	0.000
LGM-30G Airborne Procedures Trainer Replacement (APT-R) PMA	TBD	Various : Various	0.000	-		-		0.424	Jan 2021	-		0.424	Continuing	Continuing	-
Subtotal			0.000	8.954		13.175		2.279		-		2.279	Continuing	Continuing	N/A
Project Cost Totals			0.000	63.388		69.251		15.879		-		15.879	Continuing	Continuing	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 / 7	R-1 Program Element (Number/Name) PE 0101213F / <i>Minuteman Squadrons</i>	Project (Number/Name) 672983 / <i>MM Ground and Comm Equipment</i>
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	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
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Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force	Date: February 2020
Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 0101213F / <i>Minuteman Squadrons</i>
Project (Number/Name) 672983 / <i>MM Ground and Comm Equipment</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
MM Ground and Comm Equipment																												
ALCS-R Technology Maturation and Risk Reduction Phase	■	■	■	■																								
ASU Engineering and Manufacturing Development Phase	■	■																										
ASU Milestone C (May 2019)			■																									
ASU Production and Deployment Phase										■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
ASU RAA (Sep 2024)																										■		
FRBP SLEP Milestone B (Feb 2020)							■																					
FRBP SLEP Engineering & Manufacturing Development Phase										■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
FRBP SLEP Milestone C (Aug 2022)																											■	
FRBP SLEP Production & Deployment Phase																											■	
FRBP SLEP RAA (Dec 2023)																											■	
LCCB Engineering and Manufacturing Development Phase	■	■	■	■																								
LCCB Milestone C (Feb 2019)			■																									
LCCB Production and Deployment Phase										■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
LCCB RAA (Mar 2020)								■																				
LCCBU Engineering and Manufacturing Development Phase	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
LCCBU Milestone C (Feb 2020)								■																				
LCCBU Production and Deployment Phase										■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
LCCBU RAA (July 2022)																											■	
RVA II Engineering and Manufacturing Development Phase II	■	■	■	■																								
RVA II CDR (Feb 2019)			■																									

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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 0101213F / <i>Minuteman Squadrons</i>	Project (Number/Name) 672983 / <i>MM Ground and Comm Equipment</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>MM Ground and Comm Equipment</i>				
ALCS-R Technology Maturation and Risk Reduction Phase	1	2019	3	2019
ASU Engineering and Manufacturing Development Phase	1	2019	2	2019
ASU Milestone C (May 2019)	3	2019	3	2019
ASU Production and Deployment Phase	2	2021	4	2024
ASU RAA (Sep 2024)	4	2024	4	2024
FRBP SLEP Milestone B (Feb 2020)	2	2020	2	2020
FRBP SLEP Engineering & Manufacturing Development Phase	3	2020	4	2022
FRBP SLEP Milestone C (Aug 2022)	4	2022	4	2022
FRBP SLEP Production & Deployment Phase	1	2023	4	2025
FRBP SLEP RAA (Dec 2023)	1	2024	1	2024
LCCB Engineering and Manufacturing Development Phase	1	2019	2	2019
LCCB Milestone C (Feb 2019)	2	2019	2	2019
LCCB Production and Deployment Phase	2	2019	2	2020
LCCB RAA (Mar 2020)	2	2020	2	2020
LCCBU Engineering and Manufacturing Development Phase	1	2019	4	2020
LCCBU Milestone C (Feb 2020)	2	2020	2	2020
LCCBU Production and Deployment Phase	2	2020	4	2023
LCCBU RAA (July 2022)	4	2022	4	2022
RVA II Engineering and Manufacturing Development Phase II	1	2019	4	2019
RVA II CDR (Feb 2019)	2	2019	2	2019
RVA II Milestone C (Dec 2019)	1	2020	1	2020
RVA II Production and Deployment Phase	2	2020	4	2023

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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 0101213F / <i>Minuteman Squadrons</i>	Project (Number/Name) 672983 / <i>MM Ground and Comm Equipment</i>
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Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
RVA II IOC (Aug 2021)	4	2021	4	2021
RVA II FOC (Jul 2023)	3	2023	3	2023
APT-R Engineering and Manufacturing Development Phase	2	2021	2	2022

Note

ASU Engineering and Manufacturing Development Phase started 3QFY17.
 LCCB Engineering and Manufacturing Development Phase started 2QFY17.
 LCCBU Engineering and Manufacturing Development Phase started 3QFY17.
 RVA II Engineering and Manufacturing Development Phase I started 2QFY17.
 APT-R Engineering and Manufacturing Development Phase started 2QFY21.

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force										Date: February 2020		
Appropriation/Budget Activity 3600 / 7					R-1 Program Element (Number/Name) PE 0101213F / <i>Minuteman Squadrons</i>				Project (Number/Name) 672984 / <i>MM III Baseline Support</i>			
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
672984: <i>MM III Baseline Support</i>	0.000	90.606	14.816	96.246	0.000	96.246	94.265	13.153	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

MM III Baseline Support program replaces or upgrades obsolete/unsupportable flight test unique equipment installed on the missile during flight test, used to test MM III systems on the ground, or located at test facilities to collect, process, and analyze test data. Flight test equipment supports test and evaluation of MM III capabilities, and MM III Operational Test Launches (OTLs) to determine ICBM force readiness, reliability and capability shortfalls. Efforts include development, qualification, integration and testing of replacement equipment such as LGM-30G Arm Disarm Switch Replacement (ADSR) and LGM-30G Flight Test Telemetry and Termination System (FT3). These programs will also implement processes, procedures and data systems to mitigate the transition risk from MM III to Ground Based Strategic Deterrent (GBSD). As other similar equipment is identified for replacement, it will be added to this program. MM III Baseline Support also provides for other MM III unique government costs, studies of system performance, contract closeout costs, cost trades and acquisition planning activities, up to and including proposal preparation, for future capabilities.

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

	FY 2019	FY 2020	FY 2021
Title: LGM-30G Arm Disarm Switch Replacement (ADSR)	0.273	2.820	4.274
<p>Description: The ADSR program designs, develops, fabricates and tests replacements for the aging Arm/Disarm (A/D) switches currently on the MM III Missile fleet. The A/D switch is responsible for completing or interrupting ordnance electrical circuits. A/D switches are placed at five key locations in the system: Interstage I-II, Stage II Liquid Injection Thrust Vector Control (LITVC) and Roll Control, Interstage II-III, PSRE Staging, and PSRE Isolation Valves. Aging and surveillance is an ongoing study to generate a trade-off curve between reliability/availability and cost.</p> <p>Reliability/availability are monitored by periodic testing to discover unforeseen issues. Because not all existing A/D switches can be repaired/refurbished, the number in inventory will eventually be inadequate to meet the need of the PDM cycle. Supply is estimated to deplete by approximately FY24 with repair/refurbish mitigation. Repair/refurbish is a reliable mitigation plan to meet the ongoing needs of the fleet while a manufacturer is selected and the manufacturing system is selected to develop a replacement A/D switch that meets requirements and production quantities through 2036.</p> <p>FY 2020 Plans:</p> <ul style="list-style-type: none"> • Conduct System Requirement Review/System Functional Review • Complete Integrated Baseline Review • Complete Preliminary Design Review • Complete Critical Design Review <p>FY 2021 Plans:</p> <ul style="list-style-type: none"> • Conduct qualification testing on A/D designs 			

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force		Date: February 2020		
Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 0101213F / <i>Minuteman Squadrons</i>	Project (Number/Name) 672984 / <i>MM III Baseline Support</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
<ul style="list-style-type: none"> • Conclude qualification activities • Conclude milestone C <p>FY 2020 to FY 2021 Increase/Decrease Statement: Funding increased due to qualification testing.</p> <p>Title: LGM-30G Flight Test Telemetry and Termination System (FT3)</p> <p>Description: The FT3 Program replaces the Mod 7 Instrumentation Wafer (Mod 7) and associated Signal Conditioner Monitor Group, and All Ordnance Destruct System (AODS) with a flight test kit. In addition, a replacement of the Launch Support System (LSS) is required to deploy the flight test kit. The flight test kit which consists of the Flight Destruct System (FDS) and a wafer-less Integrated Instrumentation System (IIS), along with an upgraded LSS, will meet 30th Space Wing Range Safety and Air Force Global Strike Command (AFGSC) requirements and resolve obsolescence concerns/issues.</p> <p>The AODS, Mod 7 Instrumentation Wafer, and LSS include many components that are not economically available, are no longer compliant with applicable Range Safety requirements, or are in need of technical modernization. Replacement of the Vandenberg Air Force Base flight test unique equipment is necessary to sustain future AFGSC Operational Test Launches (OTL), supporting USSTRATCOM requirements starting in FY22.</p> <p>The OTLs are critical to validating the continued accuracy and reliability of the MM III ICBM Weapon System until Ground Based Strategic Deterrent (GBSD) is fielded by providing valuable data to ensure a safe, secure, and effective nuclear deterrent. The FT3 System of Systems (SoS) will perform the same function as the existing systems with upgraded design features in order to comply with Air Force Space Command Manual (AFSPCMAN) 91-710, Range Safety User Requirements, Range Commander's Council 319, Flight Termination Systems Commonality Standard, and RCC-324, Global Positioning and Inertial Measurements Range Safety Tracking Systems' Commonality Standard.</p> <p>FY 2020 Plans:</p> <ul style="list-style-type: none"> • Due to FY19 funding shortfalls, program slowed down in December 2018. Program has initiated an approximate 7-month ramp-up to include restarting sub-tier vendor tasks and increasing contractor staffing. • Replan program and conduct Integrated Baseline Review once sufficient Earned Value Management (EVM) data can be assessed. • Complete Flight Termination Receiver 2.0 prototype assembly. • Initiate engineering development unit and qualification unit builds. • Continue with 33 additional component-level qualification tests. • Begin System Verification Review (SVR) activities. <p>FY 2021 Plans:</p>		88.186	9.996	91.841

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 0101213F / <i>Minuteman Squadrons</i>	Project (Number/Name) 672984 / <i>MM III Baseline Support</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
<ul style="list-style-type: none"> • Conclude the remainder of 33 component-level qualification tests. • Continue SVR activities. • Begin SoS Test Readiness Review (TRR) activities. • Begin Production Readiness Review (PRR) activities. <p>FY 2020 to FY 2021 Increase/Decrease Statement: Funding increase due to re-phasing of testing/evaluation and readiness review activities.</p>			
<p>Title: LGM-30G Baseline Support</p> <p>Description: This program provides for other MM III unique government costs, studies of system performance, contract closeout costs, cost trades, and acquisition planning activities, up to and including proposal preparation, for future capabilities.</p> <p>FY 2020 Plans:</p> <ul style="list-style-type: none"> • Conduct studies of system performance. • Conduct cost trades and acquisition planning activities, up to and including proposal preparation, for future capabilities. <p>FY 2021 Plans:</p> <ul style="list-style-type: none"> • Conduct studies of system performance. • Conduct cost trades and acquisition planning activities, up to and including proposal preparation, for future capabilities. <p>FY 2020 to FY 2021 Increase/Decrease Statement: Funding decreased due to higher priority programs.</p>	2.147	2.000	0.131
Accomplishments/Planned Programs Subtotals	90.606	14.816	96.246

C. 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>
• MPAF 03 M30MLG: <i>Minuteman III Modifications BP21</i>	0.000	0.000	0.000	-	0.000	4.534	4.469	0.000	0.000	Continuing	Continuing
• MPAF 01 00099L: <i>Missile Replacement Eq-Ballistic BP22</i>	0.000	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
• MPAF 04 M09HA1: <i>BP25</i>	0.000	20.333	1.990	-	1.990	23.983	27.280	27.282	59.597	Continuing	Continuing
Remarks											

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

Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 0101213F / <i>Minuteman Squadrons</i>	Project (Number/Name) 672984 / <i>MM III Baseline Support</i>
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D. Acquisition Strategy

Baseline Support equipment replacement efforts are reviewed to determine the best method for execution, including vendor qualification and procurement with no development required, develop and/or modification with organic depot capabilities or development with industry. Industry development for Baseline Support equipment efforts will be executed through contracts available under competitive source selections. Nuclear Surety Cross Check Analysis (NSCCA) and Independent Verification and Validation (IV&V) efforts are contracted separately. Nuclear Surety and Vulnerability analysis requirements are covered in the Acquisition Strategy.

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

Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 0101213F / Minuteman Squadrons	Project (Number/Name) 672984 / MM III Baseline Support
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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			
LGM-30G Arm Disarm Switch Replacement (ADSR)	C/CPFF	TBD : TBD	0.000	0.000		1.793	Jan 2020	2.975	Oct 2020	-		2.975	Continuing	Continuing	-
LGM-30G Flight Test Telemetry and Termination System (FT3) TMRR/EMD	C/PIIF	Boeing : Clearfield, UT	0.000	73.779	Oct 2018	8.013	Jan 2020	79.864	Dec 2020	-		79.864	Continuing	Continuing	-
LGM-30G Flight Test Telemetry and Termination System (FT3) MOTP	C/PIIF	Northrop Grumman : Clearfield, UT	0.000	4.910	Aug 2019	0.998	Aug 2020	1.811	Oct 2020	-		1.811	Continuing	Continuing	-
Subtotal			0.000	78.689		10.804		84.650		-		84.650	Continuing	Continuing	N/A

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			
LGM-30G Arm Disarm Switch Replacement (ADSR) Support	TBD	TBD : TBD	0.000	-		0.139	Jan 2020	0.211	Jan 2021	-		0.211	Continuing	Continuing	-
LGM-30G Flight Test Telemetry and Termination System (FT3) Support	C/Various	Various : Clearfield, UT	0.000	2.221	Oct 2018	0.306	Jan 2020	5.527	Oct 2020	-		5.527	Continuing	Continuing	-
LGM-30G Baseline Support	C/Various	Various : Various	0.000	2.147	Mar 2019	2.000	Mar 2020	0.131	Mar 2021	-		0.131	Continuing	Continuing	-
Subtotal			0.000	4.368		2.445		5.869		-		5.869	Continuing	Continuing	N/A

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			
LGM-30G Flight Test Telemetry and Termination System (FT3) NSCCA-PATE	C/Various	Northrop Grumman : Clearfield, UT	0.000	0.848	Jun 2019	0.060	Jun 2020	-		-		-	Continuing	Continuing	-

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

Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 0101213F / Minuteman Squadrons	Project (Number/Name) 672984 / MM III Baseline Support
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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			
LGM-30G Flight Test Telemetry and Termination System (FT3) Lead Developmental Test Organization	MIPR	AEDC/TST : AAFB, TN	0.000	0.483	Jan 2019	0.066	Jan 2020	0.878	Dec 2020	-		0.878	Continuing	Continuing	-
LGM-30G Arm Disarm Switch Replacement (ADSR) Lead Developmental Test Organization	MIPR	AEDC : HAFB, UT	0.000	0.131	May 2019	0.028	Jun 2020	0.100	Oct 2020	-		0.100	Continuing	Continuing	-
Subtotal			0.000	1.462		0.154		0.978		-		0.978	Continuing	Continuing	N/A

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			
LGM-30G Arm Disarm Switch Replacement (ADSR)	C/CPFF	Various : Various	0.000	0.000		0.000		-		-		-	Continuing	Continuing	-
LGM-30G Arm Disarm Switch Replacement (ADSR) PMA	Various	Various : Various	0.000	0.142	May 2019	0.860	Jan 2020	0.988	Jan 2021	-		0.988	Continuing	Continuing	-
LGM-30G Flight Test Telemetry and Termination System (FT3) PMA	Various	Various : Various	0.000	2.200	Apr 2019	0.553	Jan 2020	1.592	Oct 2020	-		1.592	Continuing	Continuing	-
LGM-30G Flight Test Telemetry and Termination System (FT3) A&AS	C/FFP	BAE : Clearfield, UT	0.000	3.745	Sep 2019	-		2.169	Oct 2020	-		2.169	Continuing	Continuing	-
Subtotal			0.000	6.087		1.413		4.749		-		4.749	Continuing	Continuing	N/A

	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	0.000	90.606	14.816	96.246	-	96.246	Continuing	Continuing	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 / 7	R-1 Program Element (Number/Name) PE 0101213F / <i>Minuteman Squadrons</i>	Project (Number/Name) 672984 / <i>MM III Baseline Support</i>
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	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 0101213F / <i>Minuteman Squadrons</i>	Project (Number/Name) 672984 / <i>MM III Baseline Support</i>
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Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>MM III Baseline Support</i>				
ADSR Milestone B (Jun 2019)	3	2019	3	2019
ADSR Engineering and Manufacturing Development Phase	3	2019	1	2022
ADSR PDR (Jan 2020)	2	2020	2	2020
ADSR CDR (Apr 2020)	3	2020	3	2020
ADSR Milestone C (Sep 2021)	4	2021	4	2021
ADSR Production and Deployment Phase	1	2022	4	2023
FT3 Engineering and Manufacturing Development Phase	1	2019	2	2023
FT3 CDR (Dec 2018)	1	2019	1	2019
FT3 PRR (Jul 2022)	4	2022	4	2022
FT3 Milestone C (Jul 2022)	4	2022	4	2022
FT3 Production and Deployment Phase	4	2022	4	2025
FT3 RAA (Apr 2023)	3	2023	3	2023

Note

FT3--In order to preserve Program schedule, the Program intends to request permission from the MDA to execute Limited Deployment of the LSS and assembly of the first two Flight Test Kits ahead of PRR and Milestone C.

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force										Date: February 2020		
Appropriation/Budget Activity 3600 / 7					R-1 Program Element (Number/Name) PE 0101213F / <i>Minuteman Squadrons</i>				Project (Number/Name) 672985 / <i>MM Support Equip</i>			
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
672985: <i>MM Support Equip</i>	0.000	11.160	6.859	0.000	0.000	0.000	0.000	3.196	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In FY 2019, Project 672985, MM Support Equip - LGM-30G Transporter Erector Replacement Program (TERP), LGM-30G Payload Transporter Replacement (PTR), and LGM-30G Performance Assessment Data System Communications Equipment Interface Unit (PADS CEIU) were completed.

A. Mission Description and Budget Item Justification

MM Support Equipment program designs, develops, and tests replacement of obsolete/non-serviceable weapon system support equipment. These programs will also implement processes, procedures and data systems to mitigate the transition risk from MM III to Ground Based Strategic Deterrent (GBSD). Current efforts include design, development, and testing of support equipment such as LGM-30G Control Monitor Procedure Trainer Upgrade (CMPT), LGM-30G Performance Assessment Data System Communications Equipment Interface Unit (PADS CEIU), LGM-30G Pendulous Integrating Gyroscopic Accelerometer/G6B4 Build Equipment Replacement (PIGA/G6B4 BER), LGM-30G Payload Transporter Replacement (PTR), and LGM-30G Transporter Erector Replacement Program (TERP).

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

	FY 2019	FY 2020	FY 2021
Title: LGM-30G Pendulous Integrated Gyroscopic Accelerometer/G6B4 Build Equipment Replacement (PIGA/G6B4 BER)	2.470	4.118	0.000
Description: The Missile Guidance Set (MGS) repair is dependent on the proper functioning of the PIGA build equipment. The PIGA build and test equipment used at the repair facility is well over twenty years old and is becoming unsustainable due to obsolescence issues. This program will modify or replace the Digital Pickoff Alignment station, Electrical Alignment stations, Alignment Test stations, a Torque Test station, a Temperature Probe Calibration station, Fluid Fill stations and a Slip Ring/Module Test station.			
The G6B4 BER impacts three stations: the G6B4 Rotor Balance Test Station, the G6B4 Hydrogen Fill Station, and the Gyro F-coefficient Station (GFS). The G6B4 Rotor Balance Test Station (S-133-18024) is used to determine radial and dynamic balance of the G6B4 gyro rotor after repair, and it needs to have the obsolete Schenk balancer and console replaced. The G6B4 Hydrogen Fill Station (S-133-132-4-384) is used to fill the G6B4 with hydrogen gas following repairs, and it needs to have obsolete and failing gauges, plumbing and valves replaced. The Gyro F-coefficient Station (GFS) (S-133-18038) is used to calibrate the F-coefficient of the G6B4 gyro after repairs are complete; it needs its obsolete hydraulic and electrical power systems replaced.			
FY 2020 Plans:			
<ul style="list-style-type: none"> • Obtain Milestone B approval • Conduct Engineering, Manufacturing, & Development (EMD) Phase • Prepare and conduct Critical Design Review (CDR) • Prepare and conduct Test Readiness Review (TRR) 			

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force		Date: February 2020		
Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 0101213F / <i>Minuteman Squadrons</i>	Project (Number/Name) 672985 / <i>MM Support Equip</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
<ul style="list-style-type: none"> • Prepare for Product Readiness Review (PRR) • Perform FCA/PCA • Complete test stand development • Conduct MS C <p>FY 2021 Plans: N/A</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: Funding decreased due to program transition to Production and Deployment.</p>				
<p>Title: LGM-30G Control Monitor Procedure Trainer Upgrade (CMPT)</p> <p>Description: CMPT replaces the classroom trainer supporting start-up and shut-down of the MM III LF and missile, computer memory loading operations, and maintenance procedures. The program will update software, outdated operating systems, and obsolete/unsupportable hardware (desktop computers, motherboards, simulated programmer group, drivers, simulated cable sets, tape sets, and other miscellaneous parts) located at each Missile Wing and Vandenberg AFB necessary to continue the training capability of the CMPTs through 2030.</p> <p>FY 2020 Plans:</p> <ul style="list-style-type: none"> • Conduct Test Readiness Review • Prepare and conduct Functional and Physical Configuration Audit • Prepare and conduct MS C • Begin Production and Deployment phase <p>FY 2021 Plans: N/A</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: Funding decreased due to completion of Milestone C and start of production and deployment phase.</p>		2.814	2.741	0.000
<p>Title: LGM-30G Transporter Erector Replacement Program (TERP)</p> <p>Description: Design and develop the capabilities necessary to replace the current Transporter Erector (TE). The TE is used to emplace, extract and transport Minuteman III boosters to and from the launch facilities. TERP will update existing drawings, specifications and technical orders to eliminate parts obsolescence and address intended usage through 2030 and will qualify the new system prior to production.</p> <p>FY 2020 Plans:</p>		1.626	0.000	0.000

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force		Date: February 2020		
Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 0101213F / <i>Minuteman Squadrons</i>	Project (Number/Name) 672985 / <i>MM Support Equip</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
N/A				
FY 2021 Plans: N/A				
FY 2020 to FY 2021 Increase/Decrease Statement: N/A				
Title: LGM-30G Payload Transporter Replacement (PTR)		3.573	0.000	0.000
Description: Designs and develops the capabilities necessary to replace the current Payload Transporter tractor and trailer, mitigating emerging threat technologies and methods. The PTR replaces, extracts, and transports the MM III reentry system, propulsion system rocket engine, and missile guidance set. The new PTR design increases safety and security during transport activities and improves maintenance operations.				
FY 2020 Plans: N/A				
FY 2021 Plans: N/A				
FY 2020 to FY 2021 Increase/Decrease Statement: N/A				
Title: LGM-30G Performance Assessment Data System Communications Equipment Interface Unit (PADS CEIU)		0.677	0.000	0.000
Description: The current Communications Equipment Interface Unit (CEIU) is used to transmit MM III Inertial Measurement Unit (IMU) Performance Data (IPD) from MM III LCC to the Performance Assessment Data System (PADS) at the support base via telephone lines. The CEIU is unclassified equipment but interfaces with both classified and unclassified systems. The update will utilize more secure and reliable internet protocol transmission methods. The update effort consists of rewriting the CEIU imbedded software language using secure coding practices and changes the CEIU design from telephony to internet protocol. In addition, the PADS interfacing system is to be updated to interface with the updated CEIU design. EMD effort completed/Milestone C achieved March 2019.				
FY 2020 Plans: N/A				
FY 2021 Plans: N/A				
FY 2020 to FY 2021 Increase/Decrease Statement:				

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force	Date: February 2020
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Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 0101213F / <i>Minuteman Squadrons</i>	Project (Number/Name) 672985 / <i>MM Support Equip</i>
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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
N/A			
Accomplishments/Planned Programs Subtotals	11.160	6.859	0.000

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

Line Item	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
• MPAF 03 Line Item M30MLG: <i>MM III Modifications BP21</i>	0.000	0.859	0.129	-	0.129	0.000	0.000	0.000	0.000	Continuing	Continuing
• MPAF 01 Line Item 00099L: <i>Missile Replacement Eq-Ballistic BP22</i>	0.000	55.683	72.627	-	72.627	46.600	45.430	33.569	0.492	Continuing	Continuing
• MPAF 04 Line Item 000999: <i>Replen Spares/ Repair Parts BP25/26</i>	0.000	0.410	24.100	-	24.100	11.516	13.717	19.092	45.459	Continuing	Continuing

Remarks

D. Acquisition Strategy

Support and test equipment replacement efforts are reviewed to determine the best method for execution including vendor qualification and procurement with no development required, develop and/or modification with organic depot capabilities or development with industry. Industry development efforts for support equipment will be executed through contracts available under the Future ICBM Sustainment and Acquisition Construct (FISAC) or competitive source selections. Nuclear Surety Cross Check Analysis (NSCCA) and Independent Verification and Validation (IV&V) efforts are contracted separately. Nuclear Surety and Vulnerability analysis requirements are covered in the Acquisition Strategy.

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

Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 0101213F / Minuteman Squadrons	Project (Number/Name) 672985 / MM Support Equip
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Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
LGM-30G Pendulous Integrating Gyroscopic Accelerometer/G6B4 Build Equipment Replacement (PIGA/G6B4 BER)	SS/FPIF	Boeing : Layton, UT	0.000	2.470	Dec 2018	3.518	May 2020	-		-		-	Continuing	Continuing	-
LGM-30G Control Monitor Procedure Trainer Upgrade (CMPT) EMD	PO	309th SMXG : Hill AFB, UT	0.000	1.972	Dec 2018	2.265	Dec 2019	-		-		-	Continuing	Continuing	-
LGM-30G Transporter Erector Replacement Program (TERP) EMD	C/FPIF	DRS Environmental Systems : Cincinnati, OH	0.000	0.537	Dec 2018	-		-		-		-	Continuing	Continuing	-
LGM-30G Payload Transporter Replacement (PTR) EMD	C/CPIF	Northrop Grumman : Salt Lake City, UT	0.000	1.942	Oct 2018	-		-		-		-	Continuing	Continuing	-
LGM-30G Payload Transporter Replacement (PTR) Interim EMD	C/CPFF	ArmorWorks : Chandler, AZ	0.000	1.245	Jan 2019	-		-		-		-	0.000	1.245	-
LGM-30G Performance Assessment Data System Communications Equipment Interface Unit (PADS CEIU) Software Development	SS/CPIF	Boeing : Layton, UT	0.000	0.671	Dec 2018	-		-		-		-	Continuing	Continuing	-
Subtotal			0.000	8.837		5.783		-		-		-	Continuing	Continuing	N/A

Support (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
LGM-30G Performance Assessment Data System Communications Equipment Interface Unit (PADS CEIU) Support	Various	Various : Various	0.000	0.006	Mar 2019	-		-		-		-	Continuing	Continuing	-

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

Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 0101213F / Minuteman Squadrons	Project (Number/Name) 672985 / MM Support Equip
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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			
LGM-30G Transporter Erector Replacement Program (TERP) EMD	RO	Depot Support 309th : Hill AFB, UT	0.000	0.256	Sep 2019	-		-		-		-	Continuing	Continuing	-
Subtotal			0.000	0.262		-		-		-		-	Continuing	Continuing	N/A

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			
LGM-30G Transporter Erector Replacement Program (TERP) Test and Evaluation	Various	Various : Various	0.000	0.129	May 2019	-		-		-		-	Continuing	Continuing	-
Subtotal			0.000	0.129		-		-		-		-	Continuing	Continuing	N/A

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			
LGM-30G Pendulous Integrating Gyroscopic Accelerometer/G6B4 Build Equipment Replacement (PIGA/G6B4 BER) PMA	Various	Various : Various	0.000	0.000		0.600	Jun 2020	-		-		-	Continuing	Continuing	-
LGM-30G Transporter Erector Replacement Program (TERP) PMA	Various	Various : Various	0.000	0.200	Apr 2019	-		-		-		-	Continuing	Continuing	-
LGM-30G Control Monitor Procedure Trainer Upgrade (CMPT) PMA	Various	Various : Various	0.000	0.842	Jan 2019	0.291	Jan 2020	-		-		-	Continuing	Continuing	-
LGM-30G Control Monitor Procedure Trainer Upgrade (CMPT) A&AS	C/FFP	BAE : Clearfield, UT	0.000	-		0.185	Dec 2019	-		-		-	Continuing	Continuing	-

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Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 0101213F / Minuteman Squadrons	Project (Number/Name) 672985 / MM Support Equip
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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

MM Support Equipment																												
PIGA/G6B4 BER TMRR Phase																												
PIGA/G6B4 BER Milestone B (May 2020)																												
PIGA/G6B4 BER Engineering and Manufacturing Development Phase																												
PIGA/G6B4 BER CDR (Jun 2020)																												
PIGA/G6B4 BER TRR (Aug 2020)																												
PIGA/G6B4 BER Milestone C (May 2021)																												
PIGA/G6B4 BER Production and Deployment Phase																												
PIGA/G6B4 BER RAA (Jun 2022)																												
CMPT Engineering and Manufacturing Development Phase																												
CMPT CDR (Dec 2018)																												
CMPT Milestone C (Jun 2020)																												
CMPT Production and Deployment Phase																												
CMPT RAA (Oct 2020)																												
PTR Engineering and Manufacturing Development Phase																												
PTR Milestone C (Apr 2019)																												
PTR Production and Deployment Phase																												
PTR RAA (Aug 2025)																												
TERP Engineering and Manufacturing Development Phase																												
TERP Milestone C (Jun 2019)																												
TERP Production and Deployment Phase																												

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Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 0101213F / <i>Minuteman Squadrons</i>	Project (Number/Name) 672985 / <i>MM Support Equip</i>
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	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

TERP RAA (Sep 2022)	█																											
PADS CEIU Engineering and Manufacturing Development Phase	█																											
PADS CEIU Milestone C (Mar 2019)	█																											
PADS CEIU Production and Deployment Phase	█																											
PADS CEIU RAA (Sep 2023)	█																											

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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 0101213F / <i>Minuteman Squadrons</i>	Project (Number/Name) 672985 / <i>MM Support Equip</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>MM Support Equipment</i>				
PIGA/G6B4 BER TMRR Phase	1	2019	2	2020
PIGA/G6B4 BER Milestone B (May 2020)	3	2020	3	2020
PIGA/G6B4 BER Engineering and Manufacturing Development Phase	3	2020	3	2021
PIGA/G6B4 BER CDR (Jun 2020)	3	2020	3	2020
PIGA/G6B4 BER TRR (Aug 2020)	3	2020	3	2020
PIGA/G6B4 BER Milestone C (May 2021)	3	2021	3	2021
PIGA/G6B4 BER Production and Deployment Phase	3	2021	3	2022
PIGA/G6B4 BER RAA (Jun 2022)	3	2022	3	2022
CMPT Engineering and Manufacturing Development Phase	1	2019	3	2020
CMPT CDR (Dec 2018)	1	2019	1	2019
CMPT Milestone C (Jun 2020)	3	2020	3	2020
CMPT Production and Deployment Phase	3	2020	1	2021
CMPT RAA (Oct 2020)	1	2021	1	2021
PTR Engineering and Manufacturing Development Phase	1	2019	3	2019
PTR Milestone C (Apr 2019)	3	2019	3	2019
PTR Production and Deployment Phase	3	2019	4	2025
PTR RAA (Aug 2025)	4	2025	4	2025
TERP Engineering and Manufacturing Development Phase	1	2019	3	2019
TERP Milestone C (Jun 2019)	3	2019	3	2019
TERP Production and Deployment Phase	3	2019	4	2022
TERP RAA (Sep 2022)	4	2022	4	2022
PADS CEIU Engineering and Manufacturing Development Phase	1	2019	2	2019

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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 0101213F / <i>Minuteman Squadrons</i>	Project (Number/Name) 672985 / <i>MM Support Equip</i>
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Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
PADS CEIU Milestone C (Mar 2019)	2	2019	2	2019
PADS CEIU Production and Deployment Phase	2	2022	4	2024
PADS CEIU RAA (Sep 2023)	4	2023	4	2023

Note
 PIGA/G6B4 BER Engineering and Manufacturing Development Phase started 4QFY18.
 PTR Engineering and Manufacturing Development Phase started 4QFY12.
 TERP Engineering and Manufacturing Development Phase started 3QFY13.
 PADS CEIU Engineering and Manufacturing Development Phase started 1QFY18.

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force										Date: February 2020		
Appropriation/Budget Activity 3600 / 7					R-1 Program Element (Number/Name) PE 0101213F / <i>Minuteman Squadrons</i>				Project (Number/Name) 672986 / <i>MM Crypto Mods</i>			
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
672986: <i>MM Crypto Mods</i>	156.800	20.486	13.293	4.444	0.000	4.444	3.744	3.118	0.000	0.000	0.000	201.885
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Management Services

LGM-30G ICBM Cryptography Upgrade II PMA FY 2021 Base (BY) Cost: FY21 PMA requires same level of support as FY19-20 due to GMLEC developmental effort in support of ICU II's RAA-FOC.

A. Mission Description and Budget Item Justification

MM Crypto Mods executes USSTRATCOM, Air Force Global Strike Command, and Air Force Safety Center requirements by implementing the KS-60 capabilities in LGM-30G ICBM Cryptography Upgrade II (ICU II) of Remote Key/Code Change and Irreversible Transformation as mandated in the approved Capabilities Development Document (dated 4 Jan 05) and addresses Nuclear Weapon System Safety Group Operational Safety Review requirements 98-2, 00-1 and 02-2. It also incorporates Continuous Signal Lockout capabilities to prevent the widespread loss of status monitoring. These features will greatly increase security during code changes by reducing the frequency of open sites 75 days annually and will reduce associated resource costs for 450 Launch Facilities (LFs) and 45 Launch Control Centers (LCCs).

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

	FY 2019	FY 2020	FY 2021
Title: LGM-30G ICBM Cryptography Upgrade II (ICU II)	20.486	13.293	4.444
Description: ICU II completes design and development, implements KS-60 remote key/code change, irreversible transformation capabilities, and prevents continuous signal lockout.			
FY 2020 Plans:			
• Continue Depot Support Equipment (DSE) development			
• Conclude Independent Validation & Verification (IV&V)			
• Develop Guided Missile Launcher Electronic Circuit (GMLEC) interface modification			
FY 2021 Plans:			
• Continue Guided Missile Launcher Electronic Circuit (GMLEC) interface modification			
• Conclude Depot Support Equipment (DSE) development			
FY 2020 to FY 2021 Increase/Decrease Statement:			
Funding decreased due to ramp down of Depot Support Equipment development and IV&V activities			
Accomplishments/Planned Programs Subtotals	20.486	13.293	4.444

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force	Date: February 2020
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Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 0101213F / <i>Minuteman Squadrons</i>	Project (Number/Name) 672986 / <i>MM Crypto Mods</i>
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C. 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>
• MPAF 03 Line Item M30MLG: <i>MM III Modifications BP21</i>	50.591	37.329	31.907	-	31.907	7.812	9.839	0.000	0.000	Continuing	Continuing
• MPAF 04 Line Item <i>000999: Replen Spares/ Repair Parts BP25/26</i>	5.609	0.000	12.170	-	12.170	5.449	2.166	0.000	0.000	Continuing	Continuing

Remarks

D. Acquisition Strategy

LGM-30G ICBM Cryptography Upgrade II (ICU II) program utilizes the ICBM Prime Integration Contract (IPIC) services of Northrop Grumman (NG), which were competitively awarded for the design and development of the ICU II capability. The contract type of the ICU II Engineering and Manufacturing Development (EMD) contract is Cost Plus Incentive Fee. Also, ICU II EMD uses a separate contract for Nuclear Safety Cross Check Analysis/Performance Analysis and Technical Evaluation (NSCCA/PATE) Independent Validation & Verification (IV&V). This contract is driven by critical nuclear safety requirements to perform an independent assessment of all modifications to nuclear-certified software. The Support Equipment effort includes EMD development of Depot Support Equipment, Guided Missile Launch Electronic Circuit (GMLEC) interface modification, and Acoustic Microscope System. Nuclear Safety and Vulnerability analysis requirements are covered in the Acquisition Strategy.

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

Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 0101213F / Minuteman Squadrons	Project (Number/Name) 672986 / MM Crypto Mods
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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			
LGM-30G ICBM Cryptography Upgrade II EMD	C/CPIF	Northrop Grumman : Clearfield, UT	156.800	3.600	Feb 2019	0.600	Oct 2019	-		-		-	0.000	161.000	160.400
LGM-30G ICBM Cryptography Upgrade II Support Equipment development	C/CPFF	Northrop Grumman : Clearfield, UT	0.000	11.799	Oct 2018	7.400	Oct 2019	1.543	Oct 2020	-		1.543	Continuing	Continuing	-
LGM-30G ICBM Cryptography Upgrade II Support GMLEEC	C/CPFF	Northrop Grumman : Clearfield, UT	0.000	-		1.600	Apr 2020	1.683	Oct 2020	-		1.683	Continuing	Continuing	-
Subtotal			156.800	15.399		9.600		3.226		-		3.226	Continuing	Continuing	N/A

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			
LGM-30G ICBM Cryptography Upgrade II Nuclear Safety Support (NSCCA/IV&V)	C/CPFF	Northrop Grumman : Clearfield, UT	0.000	2.822	Oct 2018	1.000	Oct 2019	-		-		-	Continuing	Continuing	-
Subtotal			0.000	2.822		1.000		-		-		-	Continuing	Continuing	N/A

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			
LGM-30G ICBM Cryptography Upgrade II Hardware, Software, and components testing	Various	TBD : TBD	0.000	-		1.200	Dec 2019	-		-		-	Continuing	Continuing	-
LGM-30G ICBM Cryptography Upgrade II LDTO	PO	AEDC/TSTS : Arnold AFB, TN	0.000	0.072	Oct 2018	-		-		-		-	Continuing	Continuing	-
Subtotal			0.000	0.072		1.200		-		-		-	Continuing	Continuing	N/A

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Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 0101213F / <i>Minuteman Squadrons</i>	Project (Number/Name) 672986 / <i>MM Crypto Mods</i>
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	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

<i>MM Crypto Mods</i>	
ICU II Engineering and Manufacturing Development Phase	
ICU II Engineering and Manufacturing Development Phase (GMLEC)	
ICU II Production and Deployment Phase	
ICU II Initial Operational Capability (Jun 2022)	
ICU II Full Operational Capability (Jan 2024)	

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 0101213F / <i>Minuteman Squadrons</i>	Project (Number/Name) 672986 / <i>MM Crypto Mods</i>
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Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>MM Crypto Mods</i>				
ICU II Engineering and Manufacturing Development Phase	1	2019	2	2020
ICU II Engineering and Manufacturing Development Phase (GMLEC)	3	2020	3	2023
ICU II Production and Deployment Phase	1	2019	4	2024
ICU II Initial Operational Capability (Jun 2022)	3	2022	3	2022
ICU II Full Operational Capability (Jan 2024)	2	2024	2	2024