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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 0603851F / <i>Intercontinental Ballistic Missile - Dem/Val</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	-	24.994	30.969	32.959	0.000	32.959	55.370	56.088	7.358	7.493	Continuing	Continuing
641020: <i>ICBM Guidance Applications</i>	-	4.540	5.184	3.608	0.000	3.608	8.143	8.380	0.000	0.000	Continuing	Continuing
641021: <i>ICBM Propulsion Applications</i>	-	0.039	0.000	6.954	0.000	6.954	7.101	7.227	7.358	7.493	Continuing	Continuing
641022: <i>ICBM Reentry Vehicle Applications</i>	-	16.052	18.148	22.397	0.000	22.397	40.126	40.481	0.000	0.000	Continuing	Continuing
641024: <i>ICBM Command & Control (C2) Applications</i>	-	0.608	3.713	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
644209: <i>Long Range Planning (LRP)</i>	-	3.755	3.924	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

A. Mission Description and Budget Item Justification

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

The ICBM Dem/Val program will develop key enabling engineering tools for the ICBM mission to include MBSE, test software and modernization of existing analytical tools. This program will leverage existing modular system architecture and continue the maturation of modular system architecture and agile software development.

After ramping down to avoid duplication of effort with GBSD between FY16-18, ICBM Dem/Val began expanding efforts again in FY19. The majority of effort in FY21 is in RVAP to continue work in the Air Force development of the W87-R and Advanced Concept Studies.

The FY 2021 funding request was reduced by \$21.603 million to account for the availability of prior year execution balances.

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

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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 0603851F / <i>Intercontinental Ballistic Missile - Dem/Val</i>
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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	32.356	44.109	65.582	0.000	65.582
Current President's Budget	24.994	30.969	32.959	0.000	32.959
Total Adjustments	-7.362	-13.140	-32.623	0.000	-32.623
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	-13.140			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	-6.248	0.000			
• SBIR/STTR Transfer	-1.114	0.000			
• Other Adjustments	0.000	0.000	-32.623	0.000	-32.623

Change Summary Explanation

FY2019 funding reflects a \$6.248 million below threshold reprogramming and a \$1.114 million reduction for Small Business Innovation Research.
 FY2020 funding reflects a Congressional directed reduction of \$13.140 million for "Excess to need."
 FY2021 funding reduced to address higher Air Force issues

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force										Date: February 2020		
Appropriation/Budget Activity 3600 / 4					R-1 Program Element (Number/Name) PE 0603851F / <i>Intercontinental Ballistic Missile - Dem/Val</i>				Project (Number/Name) 641020 / <i>ICBM Guidance Applications</i>			
COST (\$ in Millions)	Prior Years	FY 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
641020: <i>ICBM Guidance Applications</i>	-	4.540	5.184	3.608	0.000	3.608	8.143	8.380	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

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

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

	FY 2019	FY 2020	FY 2021
Title: Guidance Applications Program	4.540	5.184	3.608
Description: Develop and mature advanced technologies and concepts to support future requirements.			
FY 2020 Plans:			
<ul style="list-style-type: none"> • Continue the evaluation and testing of strategic and space guidance-related commodities within market for potential use in a future (non-GBSD baseline) strategic guidance system; coordinate with the Navy strategic applications program. • Continue development of a Micro-Electro Mechanical System for potential insertion into the Path Length Module. • Continue expanding the Strategic Guidance Hardware independent validation & verification capability to include multi-G force environment and other various environments; perform Guidance analyses and Guidance technology studies. • Continue evaluating emerging strategic instrument technologies for future strategic grade gyros and accelerometers to ensure appropriate test capability development. • Rapidly respond to evolving warfighter priorities and emerging requirements. 			
FY 2021 Plans:			
<ul style="list-style-type: none"> • Continue the evaluation and testing of strategic and space guidance-related commodities within market for potential use in a future (non-GBSD baseline) strategic guidance system; coordinate with the Navy strategic applications program. • Continue development of a Micro-Electro Mechanical System for potential insertion into the Path Length Module. • Continue expanding the Strategic Guidance Hardware independent validation & verification capability to include multi-G force environment and other various environments; perform Guidance analyses and Guidance technology studies. 			

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3600 / 4	R-1 Program Element (Number/Name) PE 0603851F / <i>Intercontinental Ballistic Missile - Dem/Val</i>	Project (Number/Name) 641020 / <i>ICBM Guidance Applications</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
<ul style="list-style-type: none"> Continue evaluating emerging strategic instrument technologies for future strategic grade gyros and accelerometers to ensure appropriate test capability development, to include gyrometer and nested IMU development. Rapidly respond to evolving warfighter priorities and emerging requirements. <p>FY 2020 to FY 2021 Increase/Decrease Statement: Funding decreased consistent with planned activities for this project.</p>			
Accomplishments/Planned Programs Subtotals	4.540	5.184	3.608

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>
• RDTE 04 PE 0605230F: <i>GBSD</i>	401.244	557.495	1,524.759	-	1,524.759	2,536.450	3,034.370	3,072.837	3,031.610	7,327.795	21,486.560

Remarks

D. Acquisition Strategy

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

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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 0603851F / <i>Intercontinental Ballistic Missile - Dem/Val</i>	Project (Number/Name) 641020 / <i>ICBM Guidance Applications</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
GAP				
GAP Micro-Electronic Module System	2	2019	4	2022
GAP Emerging Strategic Instrument Technology Requirements	2	2019	4	2024

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force										Date: February 2020		
Appropriation/Budget Activity 3600 / 4					R-1 Program Element (Number/Name) PE 0603851F / <i>Intercontinental Ballistic Missile - Dem/Val</i>				Project (Number/Name) 641021 / <i>ICBM Propulsion Applications</i>			
COST (\$ in Millions)	Prior Years	FY 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
641021: <i>ICBM Propulsion Applications</i>	-	0.039	0.000	6.954	0.000	6.954	7.101	7.227	7.358	7.493	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

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

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

	FY 2019	FY 2020	FY 2021
Title: Propulsion Applications Program	0.039	0.000	6.954
Description: Assess, develop, evaluate, and demonstrate common solid and liquid propulsion technology and manufacturing leading up to a static fire and test of strategic propulsion systems; develop capability and explore improvements to current and future propulsion systems; and support the research and development industrial base and critical infrastructure.			
FY 2020 Plans: N/A			
FY 2021 Plans: <ul style="list-style-type: none"> Initiate propellant studies to develop alternative propulsion systems for future ICBM program insertion. Initiate propulsion system studies to develop low-toxic propellant formulations for future ICBM program insertion. Continue to monitor emerging technologies to rapidly respond to warfighter priorities and emerging requirements. 			
FY 2020 to FY 2021 Increase/Decrease Statement: Funding increased consistent with planned activities for this project including initiation of low-toxic propellant development and alternate propulsion system development for post-boost vehicle.			
Accomplishments/Planned Programs Subtotals	0.039	0.000	6.954

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3600 / 4	R-1 Program Element (Number/Name) PE 0603851F / <i>Intercontinental Ballistic Missile - Dem/Val</i>	Project (Number/Name) 641021 / <i>ICBM Propulsion Applications</i>

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>
• RDTE 04 PE 0605230F: <i>GBSD</i>	401.244	557.495	1,524.759	-	1,524.759	2,536.450	3,034.370	3,072.837	3,031.610	7,327.750	21,486.515

Remarks

D. Acquisition Strategy

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

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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 0603851F / <i>Intercontinental Ballistic Missile - Dem/Val</i>	Project (Number/Name) 641021 / <i>ICBM Propulsion Applications</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
PAP				
PAP Post Boost Propellant Studies	2	2021	4	2024
PAP Alternate Propulsion Systems/Low Toxic Propellant Studies	2	2021	4	2024

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force										Date: February 2020		
Appropriation/Budget Activity 3600 / 4					R-1 Program Element (Number/Name) PE 0603851F / <i>Intercontinental Ballistic Missile - Dem/Val</i>				Project (Number/Name) 641022 / <i>ICBM Reentry Vehicle Applications</i>			
COST (\$ in Millions)	Prior Years	FY 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
641022: <i>ICBM Reentry Vehicle Applications</i>	-	16.052	18.148	22.397	0.000	22.397	40.126	40.481	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

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

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

	FY 2019	FY 2020	FY 2021
Title: Reentry Vehicle Applications Program	16.052	18.148	22.397
Description: Mature, evaluate, and test reentry system materials, technologies, and vehicles including modeling/simulation, and ground and flight test platforms for use in current and future strategic applications.			
FY 2020 Plans:			
<ul style="list-style-type: none"> • Continue and initiate new risk reduction studies for RV nosetips to mature and evaluate future heatshield development, carbon phenolic replacements, modeling and simulation programs, manufacturing capabilities, reentry system technologies, threat development analysis and countermeasure technologies/strategies, and inform future RV capabilities. • Conduct materials development, prototyping, and test. • Develop new modeling/simulation and flight test platforms for future weapon qualification activities. • Continue supporting the Joint Technology Demonstrator. • Continue supporting the Air Force and NNSA Demonstrator Initiative and facilitate transition to Mk21A Reentry Vehicle program. • Continue study for future RV concepts. • Continue materials test platform on orbital vehicle. • Continue aeroshell modification and development studies. • Rapidly respond to evolving warfighter priorities and emerging requirements. 			
FY 2021 Plans:			
<ul style="list-style-type: none"> • Conduct materials development, prototyping, and test. 			

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3600 / 4	R-1 Program Element (Number/Name) PE 0603851F / <i>Intercontinental Ballistic Missile - Dem/Val</i>	Project (Number/Name) 641022 / <i>ICBM Reentry Vehicle Applications</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
<ul style="list-style-type: none"> • Develop new modeling/simulation and flight test platforms for future weapon qualification activities. • Continue study for future RV concepts. • Continue materials test platform on orbital vehicle. • Rapidly respond to evolving warfighter priorities and emerging requirements. • Develop designs and production concepts for trusted radiation-hardened advanced microelectronics. • Continue design of Virtual Instructor Prototype for ICBM Platforms. • Design predictive health management tool based on engineering predictive analysis. <p>FY 2020 to FY 2021 Increase/Decrease Statement: Funding increased consistent with planned activities for this project, including Virtual Instructor Prototype and Radiation-Hardened Advanced Microelectronics transitioned from Long Range Planning (Project 644209).</p>			
Accomplishments/Planned Programs Subtotals	16.052	18.148	22.397

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
• RDTE 04 0605230F: <i>Ground Based Strategic Deterrent</i>	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	21,486.560
• RDTE 07 0101328F: <i>ICBM Reentry Vehicles</i>	13.747	65.671	112.753	0.000	112.753	74.755	81.756	225.602	252.142	2,193.374	3,019.800

Remarks

D. Acquisition Strategy

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

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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 0603851F / <i>Intercontinental Ballistic Missile - Dem/Val</i>	Project (Number/Name) 641022 / <i>ICBM Reentry Vehicle Applications</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			
RVAP Support	C/FFP	BAE Systems : Clearfield, UT	-	1.283	Mar 2019	1.000	Mar 2020	1.800	Mar 2021	-		1.800	Continuing	Continuing	-
RVAP Study Support	C/FFP	Aerospace : TBD	-	-		-		0.850	Jan 2021	-		0.850	Continuing	Continuing	-
Subtotal			-	1.283		1.000		2.650		-		2.650	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			
RVAP Joint Technology Demonstrator	MIPR	SNL and LLNL : Various	-	3.664	Jan 2019	1.663	Jan 2020	-		-		-	Continuing	Continuing	-
RVAP Flight Materials Test Platform	MIPR	SAF/FMBIB : Various	-	0.500	Jul 2019	0.500	Jul 2020	0.800	Jul 2021	-		0.800	Continuing	Continuing	-
RVAP Modeling and Simulation Programs	Various	Various : Various	-	0.000		0.460	Feb 2020	1.800	Feb 2021	-		1.800	Continuing	Continuing	-
RVAP Nosetip Studies	Various	Various : Various	-	1.060	Apr 2019	4.605	Apr 2020	-		-		-	Continuing	Continuing	-
RVAP Advanced Concept Studies	Various	Various : Various	-	0.683	Jan 2019	5.365	Dec 2019	5.100	Jan 2021	-		5.100	Continuing	Continuing	-
RVAP Air Force and NNSA Demonstrator Initiative	MIPR	SNL and LLNL : Various	-	1.366	Jan 2019	0.000	Jan 2020	-		-		-	0.000	1.366	-
RVAP Aeroshell Studies	Various	Various : Various	-	1.925	Jan 2019	1.535	Jan 2020	-		-		-	Continuing	Continuing	-
RVAP Sensors Studies	Various	Various : Various	-	0.208	Jan 2019	0.588	Jan 2020	-		-		-	Continuing	Continuing	-
RVAP Virtual Instructor Prototype	C/CPFF	Johns Hopkins-A PL: : Laurel, MD	-	-		-		2.200	Apr 2021	-		2.200	Continuing	Continuing	-
RVAP Radiation-Hardened Advanced Microelectronics	Various	Various : Various	-	-		1.907	Feb 2020	9.085	Jan 2021	-		9.085	Continuing	Continuing	-
Subtotal			-	9.406		16.623		18.985		-		18.985	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 / 4				R-1 Program Element (Number/Name) PE 0603851F / <i>Intercontinental Ballistic Missile - Dem/Val</i>				Project (Number/Name) 641022 / <i>ICBM Reentry Vehicle Applications</i>					

Management Services (\$ in Millions)				FY 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
Management Services	C/CPAF	Not specified. : TBD	-	-		-		-		-		-	Continuing	Continuing	-
RVAP Program Management Administration	Various	Various : Various	-	5.363	Jan 2019	0.525	Jan 2020	0.762	Jan 2021	-		0.762	Continuing	Continuing	-
Subtotal			-	5.363		0.525		0.762		-		0.762	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			-	16.052		18.148		22.397		-		22.397	Continuing	Continuing	N/A

Remarks
 Due to limited funding in FY19, some requirements were deferred to FY20 and FY21 causing a dramatic ramp-up in FY20 and FY21 efforts.

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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 0603851F / <i>Intercontinental Ballistic Missile - Dem/Val</i>	Project (Number/Name) 641022 / <i>ICBM Reentry Vehicle Applications</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
RVAP																												
Propulsion and Rocket Motor Studies																												
RVAP Joint Technology Demonstrator																												
RVAP TPS Testing and Analysis																												
RVAP Flight Materials Test Platform																												
RVAP Modeling and Simulation Programs																												
RVAP Nosetip Studies																												
RVAP Advanced Concept Studies																												
RVAP Air Force and NNSA Demonstrator Initiative																												
RVAP Aeroshell Studies																												
RVAP Sensors Studies																												
RVAP VIPr LF Prototype Development																												
RVAP Radiation-Hardened Advanced Microelectronics																												

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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 0603851F / <i>Intercontinental Ballistic Missile - Dem/Val</i>	Project (Number/Name) 641022 / <i>ICBM Reentry Vehicle Applications</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
RVAP				
Propulsion and Rocket Motor Studies	2	2019	4	2019
RVAP Joint Technology Demonstrator	2	2019	4	2020
RVAP TPS Testing and Analysis	1	2019	2	2019
RVAP Flight Materials Test Platform	4	2019	4	2022
RVAP Modeling and Simulation Programs	2	2019	4	2023
RVAP Nosetip Studies	3	2019	4	2020
RVAP Advanced Concept Studies	1	2019	2	2023
RVAP Air Force and NNSA Demonstrator Initiative	2	2019	3	2020
RVAP Aeroshell Studies	1	2019	2	2020
RVAP Sensors Studies	2	2019	2	2019
RVAP VIPr LF Prototype Development	2	2021	1	2022
RVAP Radiation-Hardened Advanced Microelectronics	2	2020	4	2025

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force										Date: February 2020		
Appropriation/Budget Activity 3600 / 4					R-1 Program Element (Number/Name) PE 0603851F / <i>Intercontinental Ballistic Missile - Dem/Val</i>			Project (Number/Name) 641024 / <i>ICBM Command & Control (C2) Applications</i>				
COST (\$ in Millions)	Prior Years	FY 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
641024: <i>ICBM Command & Control (C2) Applications</i>	-	0.608	3.713	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

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

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

	FY 2019	FY 2020	FY 2021
Title: Command and Control Application Program	0.608	3.713	0.000
Description: Examine and develop concepts for transforming ICBM WSC2 to meet current and future requirements.			
FY 2020 Plans:			
• Initiate cyber studies of technologies to improve weapon system command and control systems management.			
• Continue Battlespace Awareness studies.			
• Rapidly respond to evolving warfighter priorities and emerging requirements.			
FY 2021 Plans:			
N/A			
FY 2020 to FY 2021 Increase/Decrease Statement:			
Funding decreased consistent with planned activities for this project.			
Accomplishments/Planned Programs Subtotals	0.608	3.713	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
• RDTE 04 PE 0605230F: <i>GBSD</i>	401.244	557.495	1,524.759	-	1,524.759	2,536.450	3,034.370	3,072.837	3,031.610	7,327.795	21,486.560

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3600 / 4	R-1 Program Element (Number/Name) PE 0603851F / <i>Intercontinental Ballistic Missile - Dem/Val</i>	Project (Number/Name) 641024 / <i>ICBM Command & Control (C2) Applications</i>

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

<u>Line Item</u>	<u>FY 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>
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Remarks

D. Acquisition Strategy

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

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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 0603851F / <i>Intercontinental Ballistic Missile - Dem/Val</i>	Project (Number/Name) 641024 / <i>ICBM Command & Control (C2) Applications</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
C2AP																												
C2AP Electronic Technical Orders																												
C2AP Battlespace Awareness Studies																												
C2AP Cyber Technologies																												

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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 0603851F / <i>Intercontinental Ballistic Missile - Dem/Val</i>	Project (Number/Name) 641024 / <i>ICBM Command & Control (C2) Applications</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
C2AP				
C2AP Electronic Technical Orders	1	2019	3	2019
C2AP Battlespace Awareness Studies	1	2019	4	2020
C2AP Cyber Technologies	2	2020	4	2020

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force										Date: February 2020		
Appropriation/Budget Activity 3600 / 4					R-1 Program Element (Number/Name) PE 0603851F / <i>Intercontinental Ballistic Missile - Dem/Val</i>				Project (Number/Name) 644209 / <i>Long Range Planning (LRP)</i>			
COST (\$ in Millions)	Prior Years	FY 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
644209: <i>Long Range Planning (LRP)</i>	-	3.755	3.924	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

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

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

	FY 2019	FY 2020	FY 2021
Title: Long Range Planning	3.755	3.924	0.000
Description: Analyze, study and plan current and future ICBM activities to meet requirements for long-term sustainment, technology insertion, employment force structure and future systems.			
FY 2020 Plans:			
<ul style="list-style-type: none"> • Continue to develop designs and production concepts for trusted strategic radiation-hardened advanced microelectronics, and transfer to Reentry Vehicle Applications. • Continue Virtual Instructor Prototype for ICBM Platforms, and transfer to Reentry Vehicle Applications. • Rapidly respond to evolving warfighter priorities and emerging requirements. 			
FY 2021 Plans: N/A			
FY 2020 to FY 2021 Increase/Decrease Statement: Funding decreased consistent with planned activities for this project, including transition of Virtual Instructor Prototype and Radiation-Hardened Advanced Microelectronics transitioned to Reentry Vehicle Applications (Project 641022).			
Accomplishments/Planned Programs Subtotals	3.755	3.924	0.000

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3600 / 4	R-1 Program Element (Number/Name) PE 0603851F / <i>Intercontinental Ballistic Missile - Dem/Val</i>	Project (Number/Name) 644209 / <i>Long Range Planning (LRP)</i>

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

<u>Line Item</u>	<u>FY 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 0605230F: <i>GBSD</i>	401.244	557.495	1,524.759	-	1,524.759	2,536.450	3,034.370	3,072.837	3,031.610	7,327.795	21,486.560

Remarks

D. Acquisition Strategy

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

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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 0603851F / <i>Intercontinental Ballistic Missile - Dem/Val</i>	Project (Number/Name) 644209 / <i>Long Range Planning (LRP)</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

LRP																												
LRP Sensor Array Detection Study																												
LRP VIPr Prototype Development																												
LRP Radiation-Hardened Advanced Microelectronics																												

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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 0603851F / <i>Intercontinental Ballistic Missile - Dem/Val</i>	Project (Number/Name) 644209 / <i>Long Range Planning (LRP)</i>

Schedule Details

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