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

Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)</i>	R-1 Program Element (Number/Name) PE 0604933F / ICBM Fuze Modernization
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COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
Total Program Element	1,001.576	151.158	129.709	98.376	0.000	98.376	72.756	14.329	0.000	0.000	0.000	1,467.904
655082: <i>ICBM FUZE SUPPORT</i>	1,001.576	151.158	129.709	98.376	0.000	98.376	72.756	14.329	0.000	0.000	0.000	1,467.904
Quantity of RDT&E Articles	46	-	27	5	-	5	10	-	-	-		

Program MDAP/MAIS Code: 0498

Note
 • Prior year RDT&E includes \$9.740M in PE 0604222F FY11 and \$39.717M in PE 0604851F FY12

A. Mission Description and Budget Item Justification

The Intercontinental Ballistic Missile (ICBM) Fuze Modernization Program is designing and developing a form, fit and functionally equivalent replacement for the Mk21 fuze that will provide a 30-year objective design life. The legacy Mk21 fuze is three times past its design life and ongoing Mk21 fuze refurbishment does not meet Nuclear Weapon Stockpile Plan requirements. The Mk21 reentry vehicle and fuze will be deployed on the current Minuteman III (MM III) and future Ground Based Strategic Deterrent (GBSD) Weapon Systems.

The US Air Force (USAF) will develop the Mk21 fuze using the National Nuclear Security Administration (NNSA) complex and the weapons system integration contractor. The NNSA complex consists of Sandia National Labs-California [SNL-CA], Sandia National Labs-New Mexico [SNL-NM] and Kansas City National Security Campus [KCNSC], formerly Kansas City Plant. The ICBM Fuze Modernization program will leverage technologies, parts, components and development/production capabilities resulting from extensive fuze work performed by the US Navy (USN) and NNSA on the Mk5/W88 Alt 370 Fuze program. The Radar Module remains entirely common with MK5 Alt-370, while the Pathlength Module and Thermal Battery Assembly designs and qualification activities remain highly leveraged and only contain minor differences from their USN counterparts. Significant design aspects of the Missile Interface Controller Module, Launch Safety Device, and the Terminal Protection Device are also similar to their USN counterparts. The Firing Set Interface Module shares common technology with the W88 Alt-370 Firing Set.

The ICBM Fuze Modernization Program will integrate the replacement fuze into MM III and the future GBSD weapon systems, to include support/test equipment, data, flight test hardware, and training materials. The program will also conduct required system testing (including ground and flight tests). The program is coordinating Mk21 fuze replacement development efforts with the DOE to synchronize USAF arming and fuze development activities with DOE warhead requirements. When prudent, the program will conduct trade studies and initiate conceptual designs to address operational system issues and meet future requirements.

The Fiscal Year 2023 budget request continues cooperative efforts with the USN to leverage common components; conduct qualification tests; and continue development of lab, ground, and flight test assets. This program also includes any needed nuclear surety and certification and system vulnerability assessments.

As a cooperative USAF, USN and NNSA acquisition, the USAF is executing the program using Department of Defense (DoD)-DOE Manual 5030.55 Joint Nuclear Weapons Life Cycle Activities (Phase 6.X process) while meeting Major Defense Acquisition Program (MDAP) statutory requirements. The Phase 6.X process is an

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iterative process that drives overlap and concurrency between activities and events that occur during the Engineering and Manufacturing Development (EMD) and Production and Deployment phases of the DoD 5000 Acquisition Series.

This program entered Phase 6.4 "Production Engineering" of the 6.X process Jan 2019. The program will conduct production engineering tasks aimed at meeting validated requirements prior to Phase 6.5.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605833F or 0605831F. In FY2021 0.000M was expended for civilian pay expenses in this program element, and in FY2022 0.000M is forecasted for civilian pay expenses in this program element.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

B. Program Change Summary (\$ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Previous President's Budget	156.693	129.709	0.000	0.000	0.000
Current President's Budget	151.158	129.709	98.376	0.000	98.376
Total Adjustments	-5.535	0.000	98.376	0.000	98.376
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	-5.535	0.000			
• Other Adjustments	0.000	0.000	98.376	0.000	98.376

Change Summary Explanation

FY2021 funding reflects a Small Business Innovation Research transfer of \$5.535 million.

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

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
Title: Fuze Design and Development	133.758	110.177	79.076
Description: Design and develop the Mk21 fuze required to support the ICBM W87 warhead. Coordinate design and development efforts with the ICBM weapon system integrator and support flight testing.			

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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>FY 2022 Plans:</p> <ul style="list-style-type: none"> • Conduct Flight Test Unit 3 testing and activities • Conduct Mass Properties Test • Conduct Mechanical Environments qualification • Conduct Hostile Shock qualification • Conduct Susceptibility Test • Conduct Cumulative Effects Test (Radiated Susceptibility and Thermal Cycle plus mechanical & electrical tests) • Conduct Mass Properties testing for Trainers • Conduct Handling Environment testing for Trainers • Conduct Accumulated Damage Testing on the Storage Environment for Trainers • Conduct Shock/Vibe testing in the transportation environment for Trainers • Further develop analytical, information technology, and data management capabilities. <p>FY 2023 Plans:</p> <ul style="list-style-type: none"> • Analyze Flight Test Unit 3 data and author Flight Test Unit 3 Test Report • Conduct Ground Test Unit 4 Integrated Test Bed Test • Conduct Radiation Test Qualification • Analyze and report Ground Test Unit 4 test results • Release Qualification Evaluation for Arming and Fuzing Assembly testers (PT3800 and PT3945) • Complete Weapons Effects Test Lab Process-Prove-In unit destructive testing and assessment • Complete final reports for qualification tests conducted in FY2022 • Update Arming and Fuzing Assembly requirement verification to include Arming and Fuzing Assembly qualification test results • Complete developmental requirements for major components • Complete Arming and Fuzing Assembly Production Readiness Review • Prepare for Full Rate Production Milestone • Further develop analytical, information technology, and data management capabilities. <p>FY 2022 to FY 2023 Increase/Decrease Statement: Funding decreased due to ramp down of development efforts and initiation of production efforts.</p>				
Title: Weapon System Integration/Systems Engineering		17.400	19.532	19.300
Description: Integrate the Mk21 fuze into the Intercontinental Ballistic Missile weapon system. Validate designs through ground tests on an Integrated Test Bed (ITB). Plan and conduct necessary ground and flight testing. Coordinate design, development and test efforts.				

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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p><i>FY 2022 Plans:</i></p> <ul style="list-style-type: none"> • Continue Basic Nuclear Safety Assessment Report updates • Continue Nuclear Surety Evaluation Report updates • Continue ICBM Compatibility Certification Report updates • Support Flight Test Unit 3 testing and activities • Validate Technical Order updates • Chair Survivability Task Team (STT) • Perform Comparative Analysis Phase II • Operate & Maintain ITB Fuze System Tester • Support Fuze PESHE update and incorporation into GBSD Programmatic PESHE • Perform update to Fuze Performance Specification • Support Requirements Trace Analysis • Perform Red Team Performance Assessment of SNL Radar <p><i>FY 2023 Plans:</i></p> <ul style="list-style-type: none"> • Continue Basic Nuclear Safety Assessment Report updates • Continue Nuclear Surety Evaluation Report updates • Continue ICBM Compatibility Certification Report updates • Support Flight Test Unit 3 data analysis and reporting • Support Ground Test Unit 4 Integrated Test Bed test • Support Ground Test Unit 4 data analysis and reporting • Chair Survivability Task Team (STT) • Perform Comparative Analysis Phase III • Validate Fuze performance against Path Length • Continue various task team support • Initiate USSTRATCOM Survivability Certification • Continue Red Team Performance Assessment of SNL Radar <p><i>FY 2022 to FY 2023 Increase/Decrease Statement:</i> Funding decreased due to ramp down of development efforts and initiation of production efforts.</p>				
Accomplishments/Planned Programs Subtotals		151.158	129.709	98.376

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

<u>Line Item</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u> <u>Base</u>	<u>FY 2023</u> <u>OCO</u>	<u>FY 2023</u> <u>Total</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>FY 2026</u>	<u>FY 2027</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• MPAF 03 Line Item M30FLH: <i>ICBM Fuze Mod</i>	43.450	100.770	137.364	-	137.364	157.889	160.202	115.130	111.581	92.100	918.486
• RDTE 04 PE 0605230F: <i>Ground Based Strategic Deterrent</i>	1,397.485	2,553.541	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	3,951.026
• RDTE 05 PE 0605238F: <i>Ground Based Strategic Deterrent EMD</i>	0.000	0.000	3,614.290	-	3,614.290	3,614.629	3,255.759	3,190.113	2,628.739	4,439.300	20,742.830
• MPAF 01 Line Item MGBSD0: <i>Ground Based Strategic Deterrent</i>	0.000	10.895	0.000	-	0.000	610.586	502.720	5,689.931	6,410.554	48,355.610	61,580.296
• RDTE 07 PE 0101328F: <i>ICBM Reentry Vehicles</i>	108.625	96.313	118.616	-	118.616	368.449	640.795	698.244	595.010	420.298	3,046.350

Remarks

E. Acquisition Strategy

The ICBM Fuze Modernization program is executing a full cost reimbursable Strategic Partnership Project (SPP) with the NNSA complex using SNL as the design agent and KCNSC as the production agent. The program is a collaborative effort with the USN reducing total program cost and development time by leveraging commonality between the ICBM and Submarine Launched Ballistic Missile fuze components. The USN Mk5 Alt 370 fuze is being developed first, with the USAF Mk21 fuze effort following. Both services participate in all design and development efforts to ensure maximum use of common components, subassemblies and technologies. Both services are using NNSA/SNL to perform fuze design and development. The USAF, as lead systems integrator for the Mk21 fuze, competed a separate weapon system integration contract for integration support to assist the government with MM III unique modifications and fuze integration efforts. Both services are using KCNSC to produce fuzes.

Due to the differences between the Department of Energy and the Department of Defense acquisition processes, the program has decoupled Milestone C from Phase 6.5 and Full Rate Production from Phase 6.6. The program completed a Milestone C decision in October 2021 and is forecasted to complete a Full Rate Production Decision in 2QFY2024.

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

Appropriation/Budget Activity 3600 / 5	R-1 Program Element (Number/Name) PE 0604933F / ICBM Fuze Modernization	Project (Number/Name) 655082 / ICBM FUZE SUPPORT
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Product Development (\$ in Millions)				FY 2021		FY 2022		FY 2023 Base		FY 2023 OCO		FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Fuze Preliminary Design Development	MIPR	Sandia National Labs : Albuquerque, NM	607.307	65.683	Nov 2020	45.700	Nov 2021	41.611	Nov 2022	-		41.611	36.835	797.136	797.136
Fuze EMD	Various	Various : Various	4.223	6.661	Nov 2020	6.086	Nov 2021	3.664	Nov 2022	-		3.664	3.243	23.877	23.877
Fuze Engineering Change Orders	Various	Various : Various	8.731	3.943	Nov 2020	2.206	Nov 2021	1.528	Nov 2022	-		1.528	1.353	17.761	17.761
Fuze National Security Campus (formerly Kansas City Plant)	MIPR	National Security Campus : Kansas City, MO	193.475	53.936	Nov 2020	51.257	Nov 2021	27.633	Nov 2022	-		27.633	24.461	350.762	350.762
Fuze Weapon System Integration - ICBM Prime	C/CPAF	Northrop Grumman : Clearfield, UT	25.937	-		-		-		-		-	0.000	25.937	25.937
Fuze Weapon System Integration - RS/RV Sub-System Contract (SSC)	C/CPAF	Lockheed Martin : Valley Forge, UT	84.691	-		-		-		-		-	0.000	84.691	84.691
Fuze Weapon System Integration Contract (WSIC)	C/CPFF	Lockheed Martin : Valley Forge, PA	7.650	15.052	Jan 2021	18.700	Jan 2022	18.500	Jan 2023	-		18.500	16.377	76.279	76.279
Subtotal			932.014	145.275		123.949		92.936		-		92.936	82.269	1,376.443	N/A

Support (\$ in Millions)				FY 2021		FY 2022		FY 2023 Base		FY 2023 OCO		FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Fuze Engineering Support - BAH	C/FP	Booz Allen Hamilton : Clearfield, UT	2.757	-		-		-		-		-	0.000	2.757	2.757
Fuze Engineering Support - BAE	C/FFP	BAE : Clearfield, UT	15.131	2.260	Nov 2020	2.465	Nov 2021	-		-		-	0.000	19.856	19.856
Fuze Engineering Support - ISC	C/TBD	TBD : TBD	0.000	-		-		2.220	Nov 2022	-		2.220	1.965	4.185	4.185
Subtotal			17.888	2.260		2.465		2.220		-		2.220	1.965	26.798	N/A

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Test and Evaluation (\$ in Millions)				FY 2021		FY 2022		FY 2023 Base		FY 2023 OCO		FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Fuze Lead Project Office Support	MIPR	AFNWC : Albuquerque, NM	10.480	-		-		-		-		-	0.000	10.480	10.480
Fuze Finite Element Model Validation	C/CPFF	LMTF : Little Mountain, UT	1.843	-		-		-		-		-	0.000	1.843	1.843
Fuze Flight Test Support and Evaluation	Various	Various : Various	10.534	0.135	Jan 2021	-		-		-		-	0.000	10.669	10.669
Subtotal			22.857	0.135		-		-		-		-	0.000	22.992	N/A

Remarks
The design agent, Sandia National Laboratories (listed as Fuze Preliminary Design Development in the R-3 Development section), is executing the test and evaluation efforts within the main design effort. There are no discretely funded test and evaluation efforts outside of the design agent's activities.

Management Services (\$ in Millions)				FY 2021		FY 2022		FY 2023 Base		FY 2023 OCO		FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Fuze Cost and Financial Management	C/FFP	Tecelote : Salt Lake City, UT	5.157	-		-		-		-		-	0.000	5.157	5.157
Fuze FFRDC Support	MIPR	Aerospace : Los Angeles, CA	6.903	0.739	Nov 2020	0.780	Nov 2021	0.780	Nov 2022	-		0.780	0.690	9.892	9.892
Fuze Program Support	C/FFP	BAE : Clearfield, UT	1.285	-		-		-		-		-	0.000	1.285	1.285
Fuze Program Management Administration	Various	Various : Various	15.472	2.749	Jul 2021	2.515	Nov 2021	2.440	Nov 2022	-		2.440	2.160	25.336	25.336
Subtotal			28.817	3.488		3.295		3.220		-		3.220	2.850	41.670	N/A

	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals		1,001.576	151.158	129.709	98.376	98.376	87.084	1,467.903	N/A

Remarks
Prior year RDT&E includes \$9.740M in PE 0604222F FY11 and \$39.717M in PE 0604851F FY12

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Exhibit R-4, RDT&E Schedule Profile: PB 2023 Air Force **Date:** April 2022

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	FY 2021				FY 2022				FY 2023				FY 2024				FY 2025				FY 2026				FY 2027			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4

AF ICBM Fuze Modernization Program	
Engineering and Manufacturing Development	
Complete Engineering Release (Oct 2020)	
Milestone C Review (Oct 2021)	
Production and Deployment	
Flight Test 3 (Aug 2022)	
Production Readiness Review (Dec 2022)	
Flight Test 4 (Feb 2024)	
Full Rate Production Decision (Mar 2024)	
DOE Phase 6.5 Milestone Decision (May 2024)	
First Production Unit (May 2024)	
Initial Operating Capability (Feb 2025)	
DOE Phase 6.6 Milestone Decision (May 2025)	

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Exhibit R-4A, RDT&E Schedule Details: PB 2023 Air Force **Date:** April 2022

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Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
AF ICBM Fuze Modernization Program				
Engineering and Manufacturing Development	1	2021	3	2025
Complete Engineering Release (Oct 2020)	1	2021	1	2021
Milestone C Review (Oct 2021)	1	2022	1	2022
Production and Deployment	1	2022	4	2027
Flight Test 3 (Aug 2022)	4	2022	4	2022
Production Readiness Review (Dec 2022)	1	2023	1	2023
Flight Test 4 (Feb 2024)	2	2024	2	2024
Full Rate Production Decision (Mar 2024)	2	2024	2	2024
DOE Phase 6.5 Milestone Decision (May 2024)	3	2024	3	2024
First Production Unit (May 2024)	3	2024	3	2024
Initial Operating Capability (Feb 2025)	2	2025	2	2025
DOE Phase 6.6 Milestone Decision (May 2025)	3	2025	3	2025

Note
 The ICBM Fuze Mod Program discovered the need to de-couple Milestone C and Full Rate Production (FRP) from Phase 6.5 and Phase 6.6 respectively. At the time of the initial baseline in 2014, Phase 6.5 and Phase 6.6 were selected as the surrogates for the DoD milestones. Since that time differences between the DOE Phase 6.x process and the DoD 5000, as it relates to funding of Title 10 programs, drove a de-coupling of these milestones into the Acquisition Program Baseline. This program is still being managed according to the Phase 6.x process but Milestone C and FRP have been added as milestones that will be accomplished to satisfy statutory requirements of a Title 10 funded acquisition.