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Exhibit R-2, RDT&E Budget Item Justification: PB 2019 Air Force										Date: February 2018		
Appropriation/Budget Activity 3600: Research, Development, Test & Evaluation, Air Force I BA 5: System Development & Demonstration (SDD)					R-1 Program Element (Number/Name) PE 0604933F I ICBM Fuze Modernization							
COST (\$ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
Total Program Element	342.385	172.946	178.991	172.902	0.000	172.902	161.199	132.926	60.016	2.035	0.000	1,223.400
655082: ICBM FUZE SUPPORT	342.385	172.946	178.991	172.902	0.000	172.902	161.199	132.926	60.016	2.035	0.000	1,223.400
Quantity of RDT&E Articles	15	10	7	16	-	16	24	16	-	-		
Program MDAP/MAIS Code: 0498												
A. Mission Description and Budget Item Justification												
<p>The ICBM Fuze Modernization Program is designing and developing a form, fit and functionally equivalent replacement for the Mk21 fuze. 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). Previous plans to integrate and test the Mk21 replacement fuze with the U.S. Department of Energy (DOE) National Nuclear Security Administration (NNSA) W78/88-1 Life Extension Program warhead were deferred.</p>												
<p>The US Air Force (USAF) will develop the Mk21 fuze utilizing the NNSA complex consisting 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; as well as a USAF weapons system integration contractor. 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 Alt 370 Fuze program. Common USN & USAF fuze components include the Radar Module (RM), Thermal Battery Assembly (TBA) and Path Length Module (PLM). USN & USAF fuze components that are partially common and use common technologies include the Missile Interface and Controller Module (MICM), Launch Safety Device (LSD), Firing Set Integration Module (FSIM) and Terminal Protection Device (TPD).</p>												
<p>The ICBM Fuze Modernization Program will integrate the replacement fuze into MM III weapon system 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.</p>												
<p>As a cooperative USAF, USN and NNSA acquisition, the USAF is executing the program using Department of Defense (DoD)-DOE Instruction 5030.55 Joint Nuclear Weapons Life Cycle Activities (Phase 6.X process) while meeting Major Defense Acquisition Program (MDAP) statutory requirements.</p>												
<p>The FY19 budget request continues cooperative efforts with the USN to leverage common components; continues design efforts for AF unique components; and continues development of lab, ground and flight test assets. This program also includes any needed nuclear surety and certification and system vulnerability assessments.</p>												

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This program element may include necessary civilian pay expenses required to manage, execute, and deliver ICBM Fuze weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826F, 0605827F, 0605828F, 0605829F, 0605830F, 0605831F, 0605832F, 0605833F, and 0605898F.						
This program is in Budget Activity 5, System Development and Demonstration (SDD), and continues to execute Phase 6.3 "Development Engineering" of the 6.X process. The program is conducting engineering development tasks aimed at meeting validated requirements prior to Phase 6.4 "Production Engineering", scheduled for FY19 (Objective).						
B. Program Change Summary (\$ in Millions)		FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Previous President's Budget		189.751	178.991	168.101	0.000	168.101
Current President's Budget		172.946	178.991	172.902	0.000	172.902
Total Adjustments		-16.805	0.000	4.801	0.000	4.801
• 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		-9.999	0.000			
• SBIR/STTR Transfer		-6.806	0.000			
• Other Adjustments		0.000	0.000	4.801	0.000	4.801
Change Summary Explanation						
FY17 funding reflects a -\$9.999M realignment to higher Air Force priorities.						
FY17 funding reflects a -\$6.806M adjustment for Small Business Innovative Research (SBIR).						
FY19 funding reflects a \$4.801M increase to match the updated cost estimate.						
C. Accomplishments/Planned Programs (\$ in Millions)				FY 2017	FY 2018	FY 2019
Title: Fuze Design and Development				149.620	139.357	128.992
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.						
FY 2018 Plans:						
• Continue assessing, testing and qualifying the common components (RM, PLM, TBA) with the unique AF environments to ensure compliance to AF requirements						
• Accomplish engineering and design work for the AF unique components						

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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2017	FY 2018	FY 2019
<ul style="list-style-type: none"> • Conduct Design Reviews • Prepare and complete all planning and coordination for Flight Test 1 • Continue to mature surveillance strategy plan in order to finalize the requirements for assessing the aging trends, reliability and service life estimate during fuze operational and sustainment phase • Begin preparations for AFA final design review • Begin flight test planning for Flight Test Unit 2 FY 2019 Plans: <ul style="list-style-type: none"> • Continue assessing, testing and qualifying the common components (RM, PLM, TBA) with the unique AF environments to ensure compliance to AF requirements • Continue to refine engineering and design work for the AF unique components • Conduct AF unique component Final Design Reviews • Execute and conduct post test analysis of Flight Test 1 and Ground Test Unit (GTU) 2 • Prepare and complete all planning and coordination for Flight Test 2 • Finalize surveillance and sustainment strategy plans • Continue preparations for AFA Final Design Review • Begin planning for GTU 3 • Conduct Trainer Fuze Final Design Review • Begin AFA Production Process Prove-In • Prepare and conduct Lab Test Unit 3 • Baseline Design Review of JTA4a • Begin preparations for JTA4a developmental flight test FY 2018 to FY 2019 Increase/Decrease Statement: Funding decreased due to ramp down as the program prepares for Production and Deployment				
Title: Weapon System Integration/Systems Engineering Description: Integrate Mk21 fuze into the MMIII 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. FY 2018 Plans: <ul style="list-style-type: none"> • Perform test and integration on Ground Test Unit (GTU) 1 for mechanical environmental, electrical integration, and performance • Perform integration testing of Application Specific Integrated Circuit (ASIC) • Finalize GTU 1 and GTU 1B test data • Analyze test data for continued design confidence 		23.326	39.634	43.910

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C. Accomplishments/Planned Programs (\$ in Millions)										FY 2017	FY 2018	FY 2019
• Provide integration support												
FY 2019 Plans:												
• Perform test and integration on GTU 2 for mechanical environmental, electrical integration, and performance												
• Conduct 80% In-Process Technical Order Review												
• Conduct Pathfinder 1 testing												
• Conduct Electrical Compatibility Test 2												
• Provide integration support												
FY 2018 to FY 2019 Increase/Decrease Statement:												
Funding increased due to integration efforts in FY19 as the program executes Flight Test Unit 1.												
Accomplishments/Planned Programs Subtotals										172.946	178.991	172.902
D. Other Program Funding Summary (\$ in Millions)												
Line Item	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost	
• MPAF 05 Line Item M30MLG: Minuteman III Modifications	-	-	-	-	-	-	-	-	-	0.000	0.000	
• MPAF 03 Line Item M30FLH: ICBM Fuze Mod	17.095	6.334	19.867	-	19.867	19.497	45.727	100.627	112.433	474.447	796.027	
Remarks												
Other Program Funding Summary reflects equipment buys in FY15-19 as part of life of type buys, enabling the ICBM Fuze Modernization program to continue leveraging the USN design, development and production activities.												
E. Acquisition Strategy												
The USAF ICBM Fuze Modernization program is executing a full cost reimbursable Work for Others (WFO) agreement 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. The USN Mk5 Alt 370 fuze entered Phase 6.3 Development Engineering in October 2012. USAF Mk21 fuze entered Phase 6.3 in August 2013. 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 (WSIC) for integration support to assist the government with MM III unique modifications and fuze integration efforts. Both services are using KCNSC to produce fuzes.												

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F. Performance Metrics Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.		

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Air Force												Date: February 2018			
Appropriation/Budget Activity 3600 / 5						R-1 Program Element (Number/Name) PE 0604933F / ICBM Fuze Modernization				Project (Number/Name) 655082 / ICBM FUZE SUPPORT					
Product Development (\$ in Millions)				FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 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
Fuze Preliminary Design Development	MIPR	Sandia National Labs : Albuquerque, NM	222.866	117.970	Nov 2016	112.447	Nov 2017	100.500	Nov 2018	-		100.500	233.135	786.918	750.625
Fuze EMD	Various	Various : Various	0.660	1.086	Dec 2016	-		1.115	Dec 2018	-		1.115	1.649	4.510	4.510
Fuze Engineering Change Orders	TBD	TBD : TBD	-	-		4.175	May 2018	3.106	May 2019	-		3.106	13.421	20.702	20.702
Fuze National Security Campus (formerly Kansas City Plant)	MIPR	National Security Campus : Kansas City, MO	21.350	31.650	Nov 2016	22.735	Nov 2017	25.386	Nov 2018	-		25.386	42.844	143.965	139.005
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)	SS/CPAF	Lockheed Martin : Valley Forge, PA	35.386	17.556	Jan 2017	20.885	Jan 2018	20.407	Jan 2019	-		20.407	0.000	94.234	96.210
Fuze Nuclear Safety Cross-Check Analysis (NSCCA)	TBD	TBD : TBD	-	-		-		-		-		-	7.945	7.945	7.945
Subtotal			306.199	168.262		160.242		150.514		-		150.514	298.994	1,084.211	N/A
Support (\$ in Millions)				FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 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
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	7.070	2.451	Jul 2017	4.000	Jul 2018	1.843	Jul 2019	-		1.843	30.947	46.311	47.506
Subtotal			9.827	2.451		4.000		1.843		-		1.843	30.947	49.068	N/A

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Appropriation/Budget Activity 3600 / 5						R-1 Program Element (Number/Name) PE 0604933F / ICBM Fuze Modernization				Project (Number/Name) 655082 / ICBM FUZE SUPPORT					
Test and Evaluation (\$ in Millions)				FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 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
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 Hardware	TBD	TBD : TBD	-	-		-		8.000	Dec 2018	-		8.000	0.000	8.000	8.000
Fuze Flight Test Support and Evaluation	Various	Various : Various	-	0.360	Aug 2017	8.502	Feb 2018	9.208	Feb 2019	-		9.208	18.849	36.919	36.919
Subtotal			12.323	0.360		8.502		17.208		-		17.208	18.849	57.242	N/A
Management Services (\$ in Millions)				FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 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
Fuze Cost and Financial Management	C/FFP	Tecolote : Salt Lake City, UT	3.302	0.393	Dec 2016	1.950	Dec 2017	-		-		-	0.000	5.645	5.637
Fuze FFRDC Support	MIPR	Aerospace : Los Angeles, CA	3.590	-		2.100	Dec 2017	-		-		-	0.000	5.690	5.690
Fuze Program Support	C/FFP	BAE : Clearfield, UT	-	0.250	Feb 2017	1.400	Feb 2018	0.816	Jul 2019	-		0.816	3.491	5.957	5.957
Fuze Program Management Administration	Various	Various : Various	7.144	1.230	Mar 2017	0.797	Mar 2018	2.521	Mar 2019	-		2.521	3.895	15.587	15.347
Subtotal			14.036	1.873		6.247		3.337		-		3.337	7.386	32.879	N/A
			Prior Years	FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			342.385	172.946		178.991		172.902		-		172.902	356.176	1,223.400	N/A
Remarks															

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Exhibit R-4, RDT&E Schedule Profile: PB 2019 Air Force

Date: February 2018

Appropriation/Budget Activity

3600 / 5

R-1 Program Element (Number/Name)

PE 0604933F / ICBM Fuze Modernization

Project (Number/Name)

655082 / ICBM FUZE SUPPORT

	FY 2017				FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023			
	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																												
Phase 6.3 Developmental Engineering																												
Phase 6.4 Production Engineering Mk21																												
Phase 6.5 Low Scale Production																												
Phase 6.6 Full Scale Production																												
Baseline Design Review (BDR) (May 2017)																												
Final Design Review (FDR) (Dec 2019)																												
Complete Engineering Release (Jun 2020)																												
Production Readiness Review (Feb 2022)																												
First Production Unit (Sep 2022)																												
Required Assets Available (Jul 2023)																												
Flight Test 1 (Oct 2018)																												
Flight Test 2 (Oct 2019)																												
Flight Test 3 (Jul 2021)																												
Flight Test 4 (Mar 2022)																												
Life of Type Buy (LOTB)																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2019 Air Force			Date: February 2018
Appropriation/Budget Activity 3600 / 5	R-1 Program Element (Number/Name) PE 0604933F / ICBM Fuze Modernization	Project (Number/Name) 655082 / ICBM FUZE SUPPORT	

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>AF ICBM Fuze Modernization Program</i>				
Phase 6.3 Developmental Engineering	1	2017	1	2019
Phase 6.4 Production Engineering Mk21	2	2019	4	2022
Phase 6.5 Low Scale Production	4	2022	3	2023
Phase 6.6 Full Scale Production	3	2023	4	2023
Baseline Design Review (BDR) (May 2017)	3	2017	3	2017
Final Design Review (FDR) (Dec 2019)	1	2020	1	2020
Complete Engineering Release (Jun 2020)	3	2020	3	2020
Production Readiness Review (Feb 2022)	2	2022	2	2022
First Production Unit (Sep 2022)	4	2022	4	2022
Required Assets Available (Jul 2023)	4	2023	4	2023
Flight Test 1 (Oct 2018)	1	2019	1	2019
Flight Test 2 (Oct 2019)	1	2020	1	2020
Flight Test 3 (Jul 2021)	4	2021	4	2021
Flight Test 4 (Mar 2022)	2	2022	2	2022
Life of Type Buy (LOTB)	1	2017	4	2019