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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	515.331	166.571	167.659	161.199	0.000	161.199	132.926	60.016	2.035	2.071	0.000	1,207.808
655082: ICBM FUZE SUPPORT	515.331	166.571	167.659	161.199	0.000	161.199	132.926	60.016	2.035	2.071	0.000	1,207.808
Quantity of RDT&E Articles	25	-	-	-	-	-	-	-	-	-		
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 (Sandia National Labs-California [SNL-CA], Sandia National Labs-New Mexico [SNL-NM] and Kansas City National Security Campus [KCNSC], formerly Kansas City Plant) and the 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 Manual 5030.55 Joint Nuclear Weapons Life Cycle Activities (Phase 6.X process) while meeting Major Defense Acquisition Program (MDAP) statutory requirements.</p>												
<p>The FY20 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 entering Phase 6.4 "Production Engineering" of the 6.X process. The program will conduct production engineering tasks aimed at meeting validated requirements prior to Phase 6.5 "Low Scale Production", scheduled for FY22 (Objective).						
As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is \$14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.						
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget		178.991	172.902	161.199	0.000	161.199
Current President's Budget		166.571	167.659	161.199	0.000	161.199
Total Adjustments		-12.420	-5.243	0.000	0.000	0.000
• 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		-6.000	0.000			
• SBIR/STTR Transfer		-6.420	0.000			
• FFRDC Adjustment		0.000	-5.243	0.000	0.000	0.000
Change Summary Explanation						
FY 2018 funding reflects a below threshold reprogramming of \$6.000 million to Ground Based Strategic Deterrent (PE 0605320F) for higher Air Force priorities.						
FY 2018 funding reflects a Small Business Innovation Research (SBIR) adjustment of \$6.420 million.						
FY 2019 funding reflects a Federally Funded Research and Development Center (FFRDC) adjustment of \$5.243 million.						
C. Accomplishments/Planned Programs (\$ in Millions)				FY 2018	FY 2019	FY 2020
Title: Fuze Design and Development				134.989	137.408	123.787

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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
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 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 Flight Test 1 and Ground Test Unit (GTU) 2 and conduct post test analysis • 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 Joint Test Assembly (JTA) 4a • Begin preparations for JTA4a developmental flight test 				
FY 2020 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 • Execute and conduct post test analysis of Flight Test 2 • Prepare and complete all planning and coordination for GTU 3 and Flight Test 3 • Continue AFA Production Process Prove-In • Begin preparation for Final Design Review of JTA4a • Continue preparations for JTA4a developmental flight test • Conduct AFA Final Design Review • Complete Engineering Release 				
FY 2019 to FY 2020 Increase/Decrease Statement: Funding decreased due to ramp down as the program prepares for Production and Deployment				
Title: Weapon System Integration/Systems Engineering		31.582	30.251	37.412

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C. Accomplishments/Planned Programs (\$ in Millions)										FY 2018	FY 2019	FY 2020
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 2019 Plans: <ul style="list-style-type: none">• 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 2020 Plans: <ul style="list-style-type: none">•Perform test and integration on GTU 3 for mechanical environmental, electrical integration, and performance•Provide integration support•Support AFOTEC operational assessment FY 2019 to FY 2020 Increase/Decrease Statement: Funding increased as program ramps up integration efforts preparing for Production and Deployment.												
Accomplishments/Planned Programs Subtotals										166.571	167.659	161.199
D. Other Program Funding Summary (\$ in Millions)												
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost	
• MPAF 03 M30FLH: ICBM FUZE MOD	6.334	19.867	19.497	-	19.497	45.727	100.627	112.433	120.463	302.884	727.832	
Remarks												
Other Program Funding Summary reflects Advanced Procurement in FY19-24 and a continuation of life-of-type equipment buys in FY18-19, enabling the ICBM Fuze Modernization program to continue leveraging the USN design, development and production activities. Life-of-type equipment buys in FY15-17 totaled \$35.495M.												
E. Acquisition Strategy												
The ICBM Fuze Modernization program is executing a full cost reimbursable work-for-others 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/												

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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.		
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 2020 Air Force **Date:** February 2019

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 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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	340.836	89.626	Nov 2017	93.961	Nov 2018	95.103	Nov 2019	-		95.103	94.315	713.841	750.625
Fuze EMD	Various	Various : Various	1.746	-		0.919	Dec 2018	1.025	Dec 2019	-		1.025	2.370	6.060	4.510
Fuze Engineering Change Orders	Various	Various : Various	0.000	4.175	May 2018	3.106	May 2019	2.354	May 2020	-		2.354	10.042	19.677	20.702
Fuze National Security Campus (formerly Kansas City Plant)	MIPR	National Security Campus : Kansas City, MO	53.000	41.188	Nov 2017	40.342	Nov 2018	25.305	Nov 2019	-		25.305	14.386	174.221	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	52.942	16.680	Jan 2018	19.642	Jan 2019	-		-		-	0.000	89.264	96.210
Fuze Weapon System Integration	TBD	TBD : TBD	0.000	-		-		20.840	Jan 2020	-		20.840	20.500	41.340	41.340
Fuze Nuclear Safety Cross-Check Analysis (NSCCA)	TBD	TBD : TBD	0.000	-		-		-		-		-	7.945	7.945	7.945
Subtotal			474.461	151.669		157.970		144.627		-		144.627	149.558	1,078.285	N/A

Remarks

The current Fuze Weapon System Integration - RS/RV Sub-System Contract (SSC) ends in FY19 requiring a new Fuze Weapon System Integration Contract beginning in FY20.

Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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	9.521	2.699	Jul 2018	1.366	Jul 2019	1.843	Jul 2020	-		1.843	29.104	44.533	47.506

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Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Subtotal			12.278	2.699		1.366		1.843		-		1.843	29.104	47.290	N/A
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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	0.000	-		-		-		-		-	0.000	0.000	8.000
Fuze Flight Test Support and Evaluation	Various	Various : Various	0.360	4.178	Feb 2018	2.742	Feb 2019	9.429	Feb 2020	-		9.429	9.689	26.398	36.919
Subtotal			12.683	4.178		2.742		9.429		-		9.429	9.689	38.721	N/A
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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	3.695	1.462	Dec 2017	-		-		-		-	0.000	5.157	5.637
Fuze FFRDC Support	MIPR	Aerospace : Los Angeles, CA	3.590	1.248	Dec 2017	1.134	Feb 2019	1.300	Dec 2019	-		1.300	2.290	9.562	5.690
Fuze Program Support	C/FFP	BAE : Clearfield, UT	0.250	0.743	Feb 2018	0.564	Jul 2019	0.979	Feb 2020	-		0.979	2.512	5.048	5.957
Fuze Program Management Administration	Various	Various : Various	8.374	4.572	Mar 2018	3.883	Mar 2019	3.021	Mar 2020	-		3.021	3.895	23.745	15.347
Subtotal			15.909	8.025		5.581		5.300		-		5.300	8.697	43.512	N/A

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				Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals				515.331	166.571		167.659		161.199		-		161.199	197.048	1,207.808	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force	Date: February 2019
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	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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																												
Life of Type Buy (LOTB)																												
Phase 6.4 Production Engineering																												
Flight Test 1 (Feb 2019)																												
Final Design Review [FDR] (Dec 2019)																												
Flight Test 2 (Apr 2020)																												
Complete Engineering Release (Jun 2020)																												
Production Readiness Review (Feb 2022)																												
Flight Test 3 (Mar 2022)																												
Phase 6.5 Low Scale Production																												
Flight Test 4 (Nov 2022)																												
Phase 6.6 Full Scale Production																												
First Production Unit (Apr 2023)																												
Required Assets Available (Jul 2023)																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force			Date: February 2019
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
AF ICBM Fuze Modernization Program				
Phase 6.3 Developmental Engineering	1	2018	1	2019
Life of Type Buy (LOTB)	1	2018	4	2019
Phase 6.4 Production Engineering	2	2019	4	2022
Flight Test 1 (Feb 2019)	2	2019	2	2019
Final Design Review [FDR] (Dec 2019)	1	2020	1	2020
Flight Test 2 (Apr 2020)	3	2020	3	2020
Complete Engineering Release (Jun 2020)	3	2020	3	2020
Production Readiness Review (Feb 2022)	2	2022	2	2022
Flight Test 3 (Mar 2022)	2	2022	2	2022
Phase 6.5 Low Scale Production	4	2022	3	2023
Flight Test 4 (Nov 2022)	1	2023	1	2023
Phase 6.6 Full Scale Production	3	2023	4	2024
First Production Unit (Apr 2023)	3	2023	3	2023
Required Assets Available (Jul 2023)	4	2023	4	2023