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**Exhibit R-2, RDT&E Budget Item Justification:** PB 2017 Air Force **Date:** February 2016

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 5: System Development &amp; Demonstration (SDD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0604933F / ICBM Fuze Modernization
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COST (\$ in Millions)	Prior Years	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	FY 2018	FY 2019	FY 2020	FY 2021	Cost To Complete	Total Cost
Total Program Element	147.745	57.893	142.551	189.751	0.000	189.751	178.475	168.035	157.738	123.617	30.858	1,196.663
655082: <i>ICBM FUZE SUPPORT</i>	147.745	57.893	142.551	189.751	0.000	189.751	178.475	168.035	157.738	123.617	30.858	1,196.663
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-	-	-

**Program MDAP/MAIS Code:** 0498

**A. Mission Description and Budget Item Justification**

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 National Nuclear Security Administration (NNSA) W78/88-1 Life Extension Program warhead were deferred.

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 National Security Campus (NSC), 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).

The ICBM Fuze Modernization Program will integrate the replacement fuze into MM III weapon system hardware, support 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 Department of Energy (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.

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

The FY17 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.

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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>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2015</b>	<b>FY 2016</b>	<b>FY 2017 Base</b>	<b>FY 2017 OCO</b>	<b>FY 2017 Total</b>
Previous President's Budget	59.826	142.551	190.973	0.000	190.973
Current President's Budget	57.893	142.551	189.751	0.000	189.751
Total Adjustments	-1.933	0.000	-1.222	0.000	-1.222
• 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	-1.933	0.000			
• Other Adjustments	0.000	0.000	-1.222	0.000	-1.222

**Change Summary Explanation**

FY 2017 funding reflects a \$1.222M adjustment for revised inflation indices.

<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2015</b>	<b>FY 2016</b>	<b>FY 2017 Base</b>	<b>FY 2017 OCO</b>	<b>FY 2017 Total</b>
<b>Title:</b> Fuze Design and Development	43.523	111.080	151.935	0.000	151.935
<b>Description:</b> 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.					
<b>FY 2015 Accomplishments:</b>					
<ul style="list-style-type: none"> <li>•Matured development of common parts, components, and technology for application to the Mk21 replacement fuze.</li> <li>•Continued component conceptual design development of common and unique parts.</li> <li>•Conducted Component Conceptual Design Review and Integrated Baseline Review.</li> <li>•Implemented nuclear surety themes informed by trades as directed by NNSA.</li> <li>•SNL-NM continued to test common components in conjunction with group builds supporting production planning for the Radar, Thermal Battery Assembly, and Path Length Module to verify that the current Navy/AF</li> </ul>					

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<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force</i> / BA 5: <i>System Development &amp; Demonstration (SDD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0604933F / <i>ICBM Fuze Modernization</i>
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<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
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design continues to meet the AF functional requirements and unique applicable environments at the component level.

- SNL completed more concentrated detail design analysis and tests on the remaining components with AF unique sub-components (MICM, LSD, TPD and FSIM). SNL-CA will begin detailed Arming and Fuzing Assembly (AFA) qualification plans and the efforts to prepare and develop the Flight Test Vehicle for meeting the established objectives of Flight Test 1.

***FY 2016 Plans:***

- Finalize development of common parts, components, and technology for application to Mk21 replacement fuze.
- Finalize component conceptual design development of common components to include Arming and Fuzing Assembly (AFA) prototype builds.
- Ramp-up conceptual design development of AF unique components.
- Ramp up Re-entry Vehicle (RV) integration, systems engineering at SNL-CA, system qualification and flight test planning and flight test vehicle (Joint Test Assembly or JTA) development.
- SNL-NM will begin testing of common components in conjunction with the group builds supporting production planning for the Radar, Battery, and Path Length Module.
- SNL will continue to analyze the design and perform tests on the remaining four components with AF unique sub-components (MICM, LSD, TPD and FSIM). SNL-CA will continue to solidify the detailed AFA qualification plans and the efforts to prepare and develop the Flight Test Vehicle for meeting the established objectives of Flight Test 1.

***FY 2017 Base Plans:***

- Continue assessing, testing and qualifying the common components (RM, PLM, TBA) with the unique AF environments to ensure compliance to AF requirements.
- Establish a solid design baseline for the AF unique components (MICM, TPD, LSD, FSIM) and push the design envelope towards meeting the Entrance and Exit criteria of the Baseline Design Review (BDR) scheduled for May 2017.
- Finalize the Ground Test Unit for ground testing and integration testing with the Integrated Test Bed (ITB) in preparation for Flight Test 1 scheduled for Oct 2018.
- Develop 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.
- Integrate updated MM Operational Targeting Program (MOTP) software to be utilized in Flight Test 2.

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<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 5: System Development &amp; Demonstration (SDD)</i>		<b>R-1 Program Element (Number/Name)</b> PE 0604933F / <i>ICBM Fuze Modernization</i>				
<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>						
	<b>FY 2015</b>	<b>FY 2016</b>	<b>FY 2017 Base</b>	<b>FY 2017 OCO</b>	<b>FY 2017 Total</b>	
•Establish a baseline design for the Joint Test Assembly (JTA) used on Flight Test 3 and Flight Test 4.						
<b>FY 2017 OCO Plans:</b> N/A						
<b>Title:</b> Weapon System Integration/Systems Engineering						
<b>Description:</b> Integrate Mk21 fuze into the MMIII weapon system. Validate designs through ground tests on an Integrated Test Bed (ITB). Plan and conduct required ground and flight testing. Coordinate design, development and test efforts.						
<b>FY 2015 Accomplishments:</b>						
•Provided Systems Engineering, Integration, and Management expertise in support of USAF and SNL development of the Mk21 replacement fuze.						
•Integrated AFA with the MM III weapon system for partially and fully completed components during the development build.						
•Tested and verified SNL developed Lab Test Units (LTU) and corresponding Ground Test Units (GTU) using the MM III ITB to confirm the functionality of the fuze through simulated missions for signal performance, data accuracy and the required fuzing options.						
<b>FY 2016 Plans:</b>						
•Ramp-up Systems Engineering, Integration, and Management expertise in support of USAF and SNL development of the Mk21 replacement fuze.						
•Continue to integrate AFA with the MM III weapon system during the development build.						
•Continue test and verification of SNL developed LTUs and corresponding GTUs via the MM III ITB. Assess the program's impact on MM III system-level effectiveness.						
<b>FY 2017 Base Plans:</b>						
•Finalize the results of the LTU to verify the functionality and performance of multiple fuze HW components during the Integration testing with the MM III weapon system which will provide the catalyst for starting the integration testing of the GTU to perform Flight Profiles and environmental unit tests (shock, vibe, temp).						
<b>FY 2017 OCO Plans:</b> N/A						
<b>Accomplishments/Planned Programs Subtotals</b>		57.893	142.551	189.751	0.000	189.751

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

<u>Line Item</u>	<u>FY 2015</u>	<u>FY 2016</u>	<u>FY 2017</u> <u>Base</u>	<u>FY 2017</u> <u>OCO</u>	<u>FY 2017</u> <u>Total</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• MPAF: BA05: Line Item # M30MLG: <i>Minuteman III Modifications</i>	4.700	13.700	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	18.400
• MPAF: BA03: Line Item # M30FLH: <i>ICBM Fuze Mod</i>	0.000	0.000	17.095	0.000	17.095	6.321	9.841	12.094	34.145	731.963	811.459

**Remarks**

Other Program Funding Summary reflects equipment buys in FY15-19 as part of life of program 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 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 NSC 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 2017 Air Force** **Date:** February 2016

<b>Appropriation/Budget Activity</b> 3600 / 5	<b>R-1 Program Element (Number/Name)</b> PE 0604933F / ICBM Fuze Modernization	<b>Project (Number/Name)</b> 655082 / ICBM FUZE SUPPORT
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<b>Product Development (\$ in Millions)</b>				<b>FY 2015</b>		<b>FY 2016</b>		<b>FY 2017 Base</b>		<b>FY 2017 OCO</b>		<b>FY 2017 Total</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>
<b>Cost Category Item</b>	<b>Contract Method &amp; Type</b>	<b>Performing Activity &amp; Location</b>	<b>Prior Years</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>			
Fuze Preliminary Design Development	MIPR	Sandia National Labs : Albuquerque, NM	90.823	41.773	Feb 2015	96.516	Nov 2015	129.850	Nov 2016	0.000		129.850	367.820	726.782	-
Fuze EMD	Various	Various : TBD	0.441	0.326	Dec 2014	0.359	Dec 2015	0.000		0.000		0.000	0.000	1.126	-
Fuze Engineering Change Orders	Various	Various : TBD	0.000	0.000		0.000		2.785	May 2017	0.000		2.785	18.103	20.888	-
Fuze National Security Campus (formerly Kansas City Plant)	MIPR	National Security Campus : Kansas City, MO	4.000	1.750	Apr 2015	14.564	Nov 2015	19.300	Nov 2016	0.000		19.300	88.277	127.891	-
Fuze Weapon System Integration - ICBM Prime	C/CPAF	Northrop Grumman : Clearfield, UT	25.937	0.000		0.000		0.000		0.000		0.000	0.000	25.937	25.937
Fuze Weapon System Integration - RS/RV Sub-System Contract (SSC)	SS/CPAF	Lockheed Martin : Valley Forge, PA	2.563	8.706	Jan 2015	24.103	Jan 2016	22.800	Jan 2017	0.000		22.800	38.038	96.210	96.210
Fuze Nuclear Safety Cross-Check Analysis (NSCCA)	TBD	TBD : TBD	0.000	0.000		0.000		0.000		0.000		0.000	9.509	9.509	-
<b>Subtotal</b>			123.764	52.555		135.542		174.735		0.000		174.735	521.747	1,008.343	-

<b>Support (\$ in Millions)</b>				<b>FY 2015</b>		<b>FY 2016</b>		<b>FY 2017 Base</b>		<b>FY 2017 OCO</b>		<b>FY 2017 Total</b>	<b>Cost To Complete</b>	<b>Total Cost</b>	<b>Target Value of Contract</b>
<b>Cost Category Item</b>	<b>Contract Method &amp; Type</b>	<b>Performing Activity &amp; Location</b>	<b>Prior Years</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>	<b>Award Date</b>	<b>Cost</b>			
Fuze Engineering Support - BAH	C/FP	Booz Allen Hamilton : Clearfield, UT	2.757	0.000		0.000		0.000		0.000		0.000	0.000	2.757	-
Fuze Engineering Support - BAE	C/FFP	BAE : Clearfield, UT	3.705	0.675	Jul 2015	2.512	Jul 2016	3.216	Jul 2017	0.000		3.216	37.398	47.506	47.506
<b>Subtotal</b>			6.462	0.675		2.512		3.216		0.000		3.216	37.398	50.263	-

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<b>Test and Evaluation (\$ in Millions)</b>				FY 2015		FY 2016		FY 2017 Base		FY 2017 OCO		FY 2017 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		0.000		0.000		0.000		0.000	0.000	10.480	10.480
Fuze Finite Element Model Validation	C/CPFF	LMTF : Little Mountain, UT	1.843	0.000		0.000		0.000		0.000		0.000	0.000	1.843	1.843
Fuze Flight Test Hardware	TBD	TBD : TBD	0.000	0.000		0.000		0.000		0.000		0.000	16.800	16.800	-
Fuze Flight Test	TBD	TBD : TBD	0.000	0.000		0.000		0.000		0.000		0.000	28.201	28.201	-
<b>Subtotal</b>			12.323	0.000		0.000		0.000		0.000		0.000	45.001	57.324	-

<b>Management Services (\$ in Millions)</b>				FY 2015		FY 2016		FY 2017 Base		FY 2017 OCO		FY 2017 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	Tecolote : Salt Lake City, UT	1.285	0.892	Dec 2014	1.125	Dec 2015	1.762	Dec 2016	0.000		1.762	2.370	7.434	-
Fuze FFRDC Support	MIPR	Aerospace : Los Angeles, CA	0.815	2.302	Dec 2014	0.473	Dec 2015	2.284	Dec 2016	0.000		2.284	5.936	11.810	-
Fuze Program Support	C/FFP	BAE : Clearfield, UT	0.000	0.000		0.618	Feb 2016	2.472	Feb 2017	0.000		2.472	28.876	31.966	-
Fuze Program Management Administration	Various	Various : Various, UT	3.096	1.469	Dec 2014	2.281	Mar 2016	5.282	Mar 2017	0.000		5.282	17.395	29.523	-
<b>Subtotal</b>			5.196	4.663		4.497		11.800		0.000		11.800	54.577	80.733	-

	Prior Years	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	Cost To Complete	Total Cost	Target Value of Contract	
<b>Project Cost Totals</b>		147.745	57.893	142.551	189.751	0.000	189.751	658.723	1,196.663	-

**Remarks**

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**Exhibit R-4, RDT&E Schedule Profile:** PB 2017 Air Force **Date:** February 2016

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	FY 2015				FY 2016				FY 2017				FY 2018				FY 2019				FY 2020				FY 2021			
	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
Phase 6.3 Developmental Engineering																												
Phase 6.4 Production Engineering Mk21																												
Component - Conceptual Design Review (C-CDR) (Oct 2014)																												
Integrated Baseline Design Review (IBR) (May 2015)																												
Baseline Design Review (BDR) (Mar 2017)																												
Final Design Review (FDR) (Dec 2019)																												
Complete Engineering Release (Jun 2020)																												
Flight Test 1 (Oct 2018)																												
Flight Test 2 (Oct 2019)																												
Flight Test 3 (Jul 2021)																												
Life of Program Buy (LOPB)																												

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**Exhibit R-4A, RDT&E Schedule Details:** PB 2017 Air Force **Date:** February 2016

<b>Appropriation/Budget Activity</b> 3600 / 5	<b>R-1 Program Element (Number/Name)</b> PE 0604933F / ICBM Fuze Modernization	<b>Project (Number/Name)</b> 655082 / ICBM FUZE SUPPORT
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Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Phase 6.3 Developmental Engineering	1	2015	1	2019
Phase 6.4 Production Engineering Mk21	2	2019	4	2021
Component - Conceptual Design Review (C-CDR) (Oct 2014)	1	2015	1	2015
Integrated Baseline Design Review (IBR) (May 2015)	3	2015	3	2015
Baseline Design Review (BDR) (Mar 2017)	2	2017	2	2017
Final Design Review (FDR) (Dec 2019)	1	2020	1	2020
Complete Engineering Release (Jun 2020)	3	2020	3	2020
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
Life of Program Buy (LOPB)	2	2015	4	2019

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