PAIRS CASE 2022-C-0346

# INTERCONTINENTAL BALLISTIC MISSILE FUZE MODERNIZATION (ICBM FUZE MOD)

Selected Acquisition Report (SAR)

AS OF A FY 2023 PRESIDENT'S BUDGET

U.S. AIR FORCE

# Contents

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## Mission and Description

The Intercontinental Ballistic Missile Fuze Modernization (ICBM Fuze Mod) Program is providing a replacement Arming and Fuzing Assembly (AFA) for the Mk21/W87 Reentry Vehicle/Warhead. The program is executing a tailored acquisition utilizing Department of Defense (DoD) Manual 5030.55 and DoD Instruction 5000.85, in addition to Procedures for Joint DoD-Department of Energy (DOE) Nuclear Weapons Life-Cycle Activities (Phase 6.X Process), as the governing acquisition directive for program milestones and activities while meeting Major Defense Acquisition Program (MDAP) statutory requirements.

The ICBM Fuze Mod Program is providing a form, fit, and functionally equivalent replacement for the Mk21 AFA. The fuzes require recapitalization due to the legacy fuze being three times past the original design life. The legacy Mk21 Fuze has completed a refurbishment program; however, this activity does not meet fuze quantity requirements under the current known force structure. The ICBM Fuze Mod is being developed with a 30-year design life to meet current and future Combatant Command ICBM needs for Minuteman III (MMIII) and LGM-35A Sentinel. The Air Force is leveraging the Navy's Mk5 Alteration 370 program to develop and produce fuzes with common technology and components achieving cost savings and cost avoidance over the lifecycle.

# Executive Summary

## *Program Highlights Since Last Report:*

A new Milestone C Acquisition Program Baseline (APB) for the program was signed October 4, 2021, which incorporated an updated Service Cost Position (SCP) that reflects the September 22, 2021 Milestone C Independent Cost Estimate (ICE). The Milestone Decision Authority codified the Milestone C decisions in an Acquisition Decision Memorandum (ADM) signed October 29, 2021.

The Milestone C ICE was developed by the Deputy Assistant Secretary of the Air Force for Cost and Economics (SAF/FMC) to support the ICBM Fuze Mod program entry into the Production & Deployment phase. The Office of the Secretary of Defense Cost Assessment Program Evaluation delegated the Milestone C ICE to SAF/FMC per delegation memorandum dated March 9, 2021 and concurred on the ICE as the SCP on October 22, 2021. ICBM Fuze Mod program requirements are stable and the program is executing to the new baseline.

The ICE includes an update to the production quantity profile where the program's fuze quantities have decreased from 812 to 743 to align with the Air Force Global Strike Command (AFGSC) Requirements Memorandum dated July 15, 2021. The total includes the destructive production testing units required to verify operational integrity throughout the production cycle. Along with the new production quantity profile, the ICE incorporates a refinement in the Advance Procurement strategy and Life of Program Buys. The ICE adjustments have not exceeded APB thresholds or caused operational impacts to MMIII or LGM-35A Sentinel programs.

The Current Total Low Rate Initial Production (LRIP) quantity was updated from 26 to 202 by an ADM dated June 24, 2021. The new LRIP quantity will: (1) establish an initial production base for the program; (2) maintain continuity in production pending completion of initial operational testing; and (3) provide an efficient ramp-up to Full-Rate Production.

The Independent Logistics Assessment examining all product support elements was completed in May 2021 with no significant findings. The Life Cycle Sustainment Plan was completed in September 2021. A successful Arming and Fuzing Assembly (AFA) Production Readiness Review (PRR) Phase I was completed on September 2, 2021.

Decision Point #1 and Decision Point #2 nomenclature have been removed from the program's Acquisition Strategy. Decision Point #1 has been replaced by Milestone C, meeting all statutory and regulatory requirements for approval to enter Production & Deployment. Decision Point #2 has been replaced by Full Rate Production (FRP). The FRP decision will be driven by the completion of initial operational testing and requisite entrance criteria.

The program continues to remain stable and execute during a challenging COVID-19 environment. The successful passing of final AFA Final Design Review (FDR) on August 20, 2020 established the performance baseline and signified the entrance into process prove-in to ensure smooth transition to Kansas City National Security Campus and into final War Reserve production. Program projections currently maintain cost and schedule and the program will continue to monitor COVID-19 impacts closely, while adhering to local, state, and federal guidelines.

All required component redesigns are completed and tested. Final AFA FDR successfully passed August 20, 2020. The schedule was de-conflicted and took into account both the FY 2019 funding reduction and the BME capacitor issue.

There are no significant software-related issues with this program at this time.

## *History of Significant Developments Since Program Initiation*

| History of Significant Developments Since Program Initiation | |
|---|---|
| **Date** | **Significant Development Description** |
| August 2011 | National Nuclear Security Administration's (NNSA) contractors were designing, developing, and producing the Mark 21 (Mk21) 2A3660 AFA. A Determinations & Findings (D&F) was signed on August 22, 2011 to go to Sandia for the design of the 2A3660 AFA. The Production D&F was assigned on December 28, 2012 indicating that the production of the fuze would be through NNSA's Kansas City Plant. |
| August 2013 | The USD(AT&L), as the Chairman of the Nuclear Weapons Council, authorized use of the joint DoD/DOE Instruction 5030.55 for the implementation of the ICBM Fuze Mod program and entry into Phase 6.3 Development Engineering. This decision is documented in the ADM, dated August 18, 2013, entitled "Air Force Intercontinental Ballistic Missile Fuze Program Phase 6.3 Development Engineering Authorization. |
| December 2013 | ICBM Fuze Modernization Program Requirements Traceability Memorandum, dated December 12, 2013, established the performance parameters and capability characteristics objectives and thresholds. These fuze performance parameters were derived from existing Legacy Mk21 Fuze performance specifications/requirements, as well as from the requirements memorandum from AFGSC A5/8 *ICBM Fuze Modernization Requirements,* dated July 8, 2011. |
| September 2014 | DAE approved APB dated September 29, 2014. |
| February 2015 | The government executed an Integrated Baseline Review jointly with the Navy from February 26, 2015 - March 6, 2015. Upon the final concurrence of the executable baseline, the Design Agent (Sandia National Laboratories) began to officially report EVM data. |
| September 2015 | ADM dated September 22, 2015 directed the Air Force to continue to plan and execute the program based on Nuclear Weapons Council, Phase 6.X guidelines while also ensuring all MDAP statutory requirements are met. Since this decision was made after the Phase 6.X equivalent of Milestone B, the program worked to meet or determine equivalency for all Milestone B relevant statutory requirements. |
| May 2017 | Program successfully executed the Baseline Design Review on May 25, 2017. |
| January 2019 | The Fuze program successfully completed Phase 6.3 (Development Engineering) and entered Phase 6.4 (Production Engineering). Phase 6.4 covers those activities that adopt the development or sustainment design into a manufacturing system that can produce components on a production basis. |
| August 2019 | The Fuze program declared a schedule breach to FDR, PRR and DOE Phase 6.5 Milestone Decision FPU due to the FY 2019 funding reduction. The Fuze program began re-baseline activities including updating the schedule and cost estimate. |

| | |
|---|---|
| February 2020 | The Fuze program declared additional schedule breaches to Required Assets Available and DOE Phase 6.6 Milestone Decision (Full Scale Production). The delays were caused by a failure of a Base Metal Electrode capacitor during the Navy's W88 Alt370 qualification testing. The capacitor failure requires a redesign to change capacitors in four of the seven major components in the Arming and Fuzing Assembly. |
| August 2020 | The Air Force Cost Analysis Agency and the Air Force Nuclear Weapons Center developed cost estimates for the ICBM Fuze Mod program. As part of the Air Force SCP process, the two estimates were compared and reconciled consistent with the program's technical baseline. The SCP shows significant Nunn-McCurdy unit cost breaches compared to the original program APB. The updated Program Acquisition Unit Cost of $2.70M BY 2014 and the Average Procurement Unit Cost of $1.14M BY 2014 exceed the current baseline estimates of $2.32M BY 2014 and $0.96M BY 2014 by 16 and 20 percent, respectively. After this detailed re-assessment of the cost estimate including recent pre-production actuals, the PAUC and APUC breach occurred due to the increased cost estimate of future Model XI accelerometer production. |
| September 2020 | Significant Nunn-McCurdy unit cost breaches officially declared. There was a PAUC growth of 15.8% and an APUC growth of 19.6% from the original baseline reported. |
| December 2020 | A new APB for the program was signed December 11, 2020, which incorporated an updated SCP, updated Advance Procurement strategy, new schedule and threshold dates for Milestone C and FRP decision points. |
| October 2021 | A new APB for the program was signed October 4, 2021, establishing the program's Production and Deployment (P&D) phase baseline. The MDA signed the Milestone C ADM October 29, 2021, codifying Milestone C decisions and enabling formal entrance into the P&D phase of the program. |

# Schedule

## *Schedule Events*

| Events | Cat | Production APB (October 2021) Objective | Current Production APB (October 4, 2021) Objective/Threshold | | Current Estimates/Actuals |
|---|---|---|---|---|---|
| DOE Phase 6.3 Milestone Decision (Program Initiation) [1] | MS B | Aug 2013 | Aug 2013 | Aug 2013 | August 19, 2013 |
| Component Conceptual Design Review | PDR | Oct 2014 | Oct 2014 | Oct 2014 | October 15, 2014 |
| Baseline Design Review | Other | May 2017 | May 2017 | May 2017 | May 23, 2017 |
| Prototype Design Review | Other | May 2018 | May 2018 | May 2018 | May 1, 2018 |
| DOE Phase 6.4 Milestone Decision (Production Engineering) | Other | Jan 2019 | Jan 2019 | Jan 2019 | January 21, 2019 |
| Final Design Review | Other | Aug 2020 | Aug 2020 | Aug 2020 | August 19, 2020 |
| Milestone C [3] | MS C | Oct 2021 | Oct 2021 | Oct 2021 | October 29, 2021 |
| Final Production Readiness Review [4] | Other | Jan 2023 | Jan 2023 | Jan 2024 | Feb 2023 |
| Full Rate Production [3] | FRP | Mar 2024 | Mar 2024 | Mar 2025 | Mar 2024 |
| DOE Phase 6.5 Milestone Decision (First Production) [4] | Other | May 2024 | May 2024 | May 2025 | May 2024 |
| RAA [2,4] | IOC | Feb 2025 | Feb 2025 | Feb 2026 | Feb 2025 |
| DOE Phase 6.6 Milestone Decision (Full Scale Production) [4] | FRP Decision | May 2025 | May 2025 | May 2026 | May 2026 |
| Decision Point #2 | Pref Alt | Mar 2024 | Deleted | Deleted | Deleted |
| Milestone C (Decision Point #1) | MS C | Aug 2021 | Deleted | Deleted | Deleted |
| DOE Phase 6.5 Milestone Decision (First Production) | MS C | May 2024 | Deleted | Deleted | Deleted |

## Schedule Notes

1/ The Under Secretary of Defense for Acquisition, Technology and Logistics, as the Chairman of the Nuclear Weapons Council, authorized use of the joint DoD/DOE Instruction 5030.55 for the implementation of the ICBM Fuze Mod program and entry into Phase 6.3 Development Engineering. This decision is documented in the ADM, dated August 18, 2013, entitled "Air Force Intercontinental Ballistic Missile Fuze Program Phase 6.3 Development Engineering Authorization".

2/ Required Assets Available (RAA) is being used as a surrogate for Initial Operational Capability (IOC). RAA is defined as 10 Mk21 fuzes available for deployment with the technical data, test equipment, and technical training materials required to support wing operations.

3/ Decision Point #1 and Decision Point #2 have been removed. Decision Point #1 has been replaced by Milestone C and Decision Point #2 has been replaced by FRP. This decision was approved by the SAE and documented in the ADM dated June 24, 2021. FRP decision is driven by the completion of initial operational testing and completion of entrance criteria.

4/ The current estimates for Production Readiness Review, DOE Phase 6.5, RAA and DOE Phase 6.6 have been adjusted to reflect impacts of the APB schedule breach and the Nunn-McCurdy breach.

## *Significant Schedule Risks*

| Significant Schedule Risks | |
|---|---|
| Current Estimate (DEC 2021) | |
| | Application Specific Integrated Circuits (ASIC) Production Yield—If the ASIC production yield cannot meet Integrated Contract Order Schedule (ICOS) demand, then the program will continue to see slips to the ASIC delivery schedule which could ultimately effect Arming and Fuzing Assembly (AFA) critical path. |
| 2. | Launch Safety Device (LSD) Monitor Reset Plating—If the LSD Reset Monitor continues to see non-conforming plating variation that does not meet requirements, then the program will see slips in the LSD Monitor Reset delivery schedule which could ultimately effect AFA critical path. |
| 3. | Stockpile-to-Target Sequence (STS) Update and Impact on Replacement Fuze Test Program—If the W87 STS environmental requirement updates are determined to significantly alter replacement fuze Operational Safety, Suitability, and/or Effectiveness (OSS&E), then those requirements may be included in the replacement fuze performance specification and result in cost and schedule impacts to Development Agency and Production Agency activities. |
| 4. | Flight Test Unit (FTU) 3 Hardware Delivery to Vandenberg Space Force Base (VSFB)—If the FTU-3 Fuze and/or Joint Test Assembly 4a are not delivered to VSFB 90 days prior to the FTU-3 test date, then FTU-3 will be at risk for execution, resulting in significant impact to fuze qualification, Qualification Evaluation Release (QER), and First Production Unit (FPU). |

# Performance

| Performance Characteristics | | | | | |
|---|---|---|---|---|---|
| Development APB Objective | Current APB Development Objective/Threshold | | Demonstrated Performance (include Demonstrated date) | Current Estimate | Deviation |
| System Qualification Attribute 4: Fuze Replacement Design Life | | | | | |
| 30-year design life upon DoD custody. | 30-year design life upon DoD custody. | 20-year design life upon DoD custody. | TBD | 30-year design life upon DoD custody. | |

**Classified Performance information is provided in the classified annex to this submission**

## Requirements Source

ICBM Fuze Mod Performance Specification dated December 6, 2016

AFGSC Requirements Memorandum dated July 15, 2021

# Acquisition Budget Estimate

## *Total Acquisition Cost*

| | | Development APB | APB Name (Current) October 4, 2021 | | Budget Estimate PB 2023 | | |
|---|---|---|---|---|---|---|---|
| Category | Base Year | Objective (BY$) | Objective (BY$) | Threshold (BY$) | BY$ | TY$ | Deviation |
| RDT&E | 2021 | 1,285.3 | 1,508.6 | 1,659.5 | 1,508.5 | 1,467.9 | |
| Procurement | 2021 | 740.7 | 870.9 | 957.6 | 895.2 | 988.6 | |
| MILCON | | | | | | | |
| Acq. O&M | | | | | | | |
| Total | | 2,026.0 | 2,379.5 | N/A | 2,403.7 | 2,456.5 | |
| PAUC | 2021 | 2.594 | 3.203 | 3.523 | 3.235 | 3.306 | |
| APUC | 2021 | 1.069 | 1.330 | 1.463 | 1.367 | 1.509 | |

## *Total End Item Quantity*

| Quantity Category | Current APB Quantity | Current Estimate Quantity |
|---|---|---|
| Development | 88 | 88 |
| Procurement | 655 | 655 |

## Budget Notes

The current Research, Development, Test and Evaluation (RDT&E) estimate accounts for unforeseen technical and schedule risks. The procurement estimate has been updated to accommodate the production risks associated with the reduction in production quantity, Advance Procurement (AP) strategy and Life of Program Buy (LOPB) refinements. Estimate updated due to Small Business Innovation Research reduction in FY 2020. Realization of Congressional mark in FY 2020 and an Air Force Undistributed mark in FY 2020. The ICBM Fuze Mod program is being executed via a Strategic Partnership Project (SPP) agreement with the National Nuclear Security Administration and is 100% funded by the Air Force. There are no Department of Energy funds being used to support the design and production of the ICBM Fuze Mod program.

## Quantity Notes

The funded quantity of 743 includes all of the units necessary for development, qualification, certification, operational fielding, aging/surveillance, and replenishment spares.

Fuze quantities have decreased from 812 to 743 to align with the AFGSC Requirements Memorandum dated July 15, 2021 which reduced the production quantity needs of the program and shortened the service life.

## *Risk and Sensitivity Analysis*

| Risks and Sensitivity Analysis | |
|---|---|
| **Current Baseline Estimate (December 2020)** | |
| 1. | There are no discrete risks identified with the current baseline estimate. |
| **Original Baseline Estimate (September 2014)** | |
| 1. | General uncertainty and tailored cost risk was applied to the Original Baseline Estimate while taking into consideration reduced risk in leveraging Navy commonality. |
| **Revised Original Estimate (Not Applicable)** | |
| None | |
| **Current Procurement Cost (December 2021)** | |
| 1. | There are no discrete risks identified with the current estimate but general uncertainty and tailored cost risk were applied to accommodate the production risks associated with the reduction in production quantity, AP strategy and LOPB refinements. |

# Unit Cost

## *Current Baseline Compared with Current Estimate*

| Category ($M) | Current APB | Current Estimate | % Change | NMC Breach |
|---|---|---|---|---|
| PAUC | | | | |
| Cost | 2,379.5 | 2,403.7 | - | - |
| Quantity | 743 | 743 | - | - |
| Unit Cost | 3.203 | 3.235 | 1.0% | |
| APUC | | | | |
| Cost | 870.9 | 895.2 | - | - |
| Quantity | 655 | 655 | - | - |
| Unit Cost | 1.330 | 1.367 | 2.8% | |

## *Original Baseline Compared with Current Estimate*

| Category ($M) | Current APB | Current Estimate | % Change | NMC Breach |
|---|---|---|---|---|
| PAUC | | | | |
| Cost | 2,026.0 | 2,403.7 | - | - |
| Quantity | 781 | 743 | - | - |
| Unit Cost | 2.594 | 3.235 | 24.7% | |
| APUC | | | | |
| Cost | 740.7 | 895.2 | - | - |
| Quantity | 693 | 655 | - | - |
| Unit Cost | 1.069 | 1.367 | 27.9% | |

## Unit Cost Notes

The Milestone C ICE was developed by the Deputy Assistant Secretary of the Air Force for Cost and Economics (SAF/FMC) to support the ICBM Fuze Mod program entry into the Production & Deployment Phase. The OSD CAPE delegated the Milestone C ICE to SAF/FMC per delegation memorandum dated March 9, 2021. A change in the production quantity profile has been implemented in this estimate which is aligned to the AFGSC Requirements Memorandum dated July 15, 2021. Along with the new production quantity profile, the ICE incorporates the refinement in the AP strategy and LOPB. These adjustments are not expected to cause operational impacts to MMIII or LGM-35A Sentinel programs. The new Fuze quantities are aligned to reflect the procurement needs of the program. The units also include the destructive production testing units required to verify operational integrity throughout the production cycle.

# Technologies and Systems Engineering

## *Significant Technical Risks*

| Significant Technical Risks | |
|---|---|
| Current Estimate (December 2021) | |
| 1. | Not Applicable |

# Contracts

This program has no Major Contracts as defined by 10 USC 4351.

# Deliveries and Expenditures

## *Deliveries*

| Deliveries | | | | |
|---|---|---|---|---|
| **Delivered to Date** | **Planned to Date** | **Actual to Date** | **Total Quantity** | **Percent Delivered** |
| Development | 46 | 46 | 88 | 52.27 |
| Production | 0 | 0 | 655 | 0.00% |
| Total Program Quantity Delivered | 46 | 46 | 743 | 6.19% |

## *Expended and Appropriated (TY $M)*

Total Acquisition Cost: 2436.5
Expended to Date: 1236.1
Percent Expended: 50.32%
Total Funding Years: 20
Years Appropriated: 12
Percent Years Appropriated: 60.00%
Appropriated to Date: 1496.9
Percent Appropriated: 60.94%

### Deliveries and Expenditures Notes

The funded quantity of 743 includes all of the units necessary for development, qualification, certification, operational fielding, aging/surveillance, and replenishment spares.

# Low Rate Initial Production

| Item | Initial LRIP Decision | Current Total LRIP |
|---|---|---|
| **Approval Date** | May 19, 2018 | June 24, 2021 |
| **Approved Quantity** | 26 | 202 |
| **Reference** | ICBM Fuze Mod Program ADM | ICBM Fuze Mod Program ADM |
| **Start Year** | FY 2020 | FY 2022 |
| **End Year** | FY 2021 | FY 2026 |

**Rationale if Current Total LRIP Quantity exceeds 10% of the total Procurement quantities:**
The Current Total LRIP quantity was updated from 26 to 202 by an ADM dated June 24, 2021. The new LRIP quantity will: (1) establish an initial production base for the program; (2) maintain continuity in production pending completion of initial operational testing; and (3) provide an efficient ramp-up to Full-Rate Production.

## LRIP Note

The 202 units include: three RDT&E funded for Operational Test and Evaluation (OT&E). Production funded units include: 35 units in FY 2022, 65 units in FY 2023, and 99 units in FY 2024. Final LRIP unit deliveries are scheduled through FY 2026.

# Operating and Support Costs

## *Total Program O&S Cost Compared with Baseline*

| | Current APB Objective (BY$) | Current APB Threshold (BY$) | Current Estimate (BY$) | Current Estimate (TY$) | Deviation |
|---|---|---|---|---|---|
| Total O&S ($Millions) | 367.5 | 404.3 | 367.5 | 592.1 | |

## *O&S Cost Breakdown*

Disposal Cost is included in the Operating and Support Cost of the current APB objective and threshold for this program.

The fuze is a relatively small component within the framework of the much larger Minuteman III weapon system. Therefore, it is not expected that there will be any change to unit level manpower, continuing system improvements, or indirect support at the wings or depot.

| Category (BY$ Million) | ICBM Fuze Modernization |
|---|---|
| Unit-Level Manpower | 0 |
| Unit Operations | 2.1 |
| Maintenance | 0 |
| Sustaining Support | 359.7 |
| Continued System Improvements | 0 |
| Other | 5.7 |
| Total O&S | 367.5 |