

AGM-183A Air-Launched Rapid Response Weapon (ARRW)



In FY24, the Air Force's AGM-183A Air-Launched Rapid Response Weapon (ARRW) program completed development of the ARRW prototype design and executed two flight tests, including an operational demonstration (Ops Demo). Testing to properly assess lethality of the weapon system was executed successfully. Data analysis from flight tests conducted during FY24 continues.

SYSTEM DESCRIPTION

ARRW is a conventional, air-launched, boost-glide, hypersonic weapon consisting of a solid rocket motor booster, a glider protective shroud, and a glider

vehicle containing a kinetic energy projectile warhead.

MISSION

The Air Force will employ units equipped with ARRW to provide an offensive, high-speed strike capability to destroy high-value,

time-sensitive, land-based targets in anti-access/area-denial environments. Launched from bomber aircraft, ARRW provides standoff capability to prosecute targets in a timely fashion.

PROGRAM

ARRW uses the rapid prototyping Middle Tier of Acquisition pathway leveraging technology and lessons learned from the Defense Advanced Research Projects Agency (DARPA)'s Tactical Boost Glide program. The program completed its Critical Design Review in February 2020. In FY21 – 22, the Air Force conducted a series of booster test flights (BTFs), followed by a series of all-up round (AUR) (including live warhead) test flights (ATFs) in FY22 – 24. In August 2023, DOT&E approved the ARRW Integrated Master Test Plan, and in February 2024 DOT&E approved the ARRW Ops Demo Plan. The Ops Demo was completed in March 2024. The Air Force is assessing the ATF results to inform the way ahead for the technologies developed in the ARRW program. DOT&E intends to publish an Ops Demo report in FY25.

» MAJOR CONTRACTOR

- Lockheed Martin Missiles and Fire Control – Orlando, Florida

TEST ADEQUACY

In FY24, the Air Force conducted two ATFs to further validate ARRW's performance in the free flight state from release through terminal maneuver as well as terminal effects. Both flight tests were adequate to demonstrate operational effectiveness and suitability, conducted in accordance with the DOT&E-

approved Ops Demo Plan, and observed by DOT&E. The AURs used during the flight tests were produced on certified pilot production lines to demonstrate AUR producibility.

In October 2023, the Air Force conducted the ATF that included a land impact (the previous ATFs in FY23 targeted broad ocean areas). In March 2024, the Air Force conducted an Ops Demo of the ARRW system, which included a land impact, to assess operational capabilities and limitations of the system.

By combining the BTF and ATF data, the Air Force collected sufficient data to demonstrate system capability in a permissive environment, but not enough information to confidently assess operational effectiveness, lethality, suitability, and survivability. From the BTF and ATF test launches, the Air Force collected data on the ARRW integration with a B-52H by releasing ARRWs from all B-52H weapon stations and across the required release conditions. The Air Force collected data on safe separation and safe deconfliction of the ARRW from a B-52H. The ATF series also provided data to demonstrate ARRW performance through all phases of flight, to include boost and ascent, booster-glide vehicle separation, and warhead function.

The Ops Demo, the capstone event of the ATF series, tested the proper function of the ARRW through all phases of flight, with all aspects of employment executed by operational personnel. The Air Force used operational aircrews

to complete mission planning, operational maintenance personnel to handle and maintain the ARRW, and operational aircraft armament personnel to upload and download the ARRW to/from a B-52H during the test. To support the Ops Demo, the Air Force provided training to the maintenance personnel and executed a maintenance demonstration.

The Air Force is in the final stages of conducting analysis of test data that captured missile and glider flight characteristics as well as warhead performance and comparing the observed results to modeling and simulation (M&S) results. Lethality of the ARRW system will be evaluated based on the test data and various M&S tools developed to support ARRW system capability.

The Air Force used engagement-level and mission-level M&S to assess ARRW survivability in anti-access/area-denial environments.

No operational cyber assessment was completed. If program elements undergo further development, a cyber assessment must be executed in future developmental iterations.

PERFORMANCE

» EFFECTIVENESS

Preliminary results indicate that the ARRW weapon system demonstrated sufficient mission capability in a permissive environment. From the combined data set, the Air Force demonstrated the ARRW would

be able to satisfy the required launch platform release conditions, downrange and cross-range requirements, and the time to place effects on target requirements that are needed to support the strike mission. Due to the limited number of ATF assets (i.e., AUR vehicles), however, there are insufficient data to determine weapon accuracy with statistical confidence from current operational testing. Moreover, the Ops Demo indicated that operational personnel could plan a mission and execute a strike on surrogate targets.

DOT&E expects to publish an Ops Demo report in FY25 after the remaining data are received from the Air Force.

» **LETHALITY**

Both ATFs in FY24 included the use of land targets to gain knowledge of ARRW lethality effects and support lethality M&S development. In both tests, the Air Force collected data on the dispersion and penetration of ARRW's fragmenting warhead. These data informed and helped to increase confidence in the lethality M&S tools. Analysis of the effects of fragment impacts on the targets' functionality is still pending. Formal accreditation of the lethality M&S supporting ARRW has not been conducted and is not anticipated, somewhat limiting the confidence of M&S to properly predict ARRW system lethality against a wide range of targets.

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» **SUITABILITY**

The limited number of flight hours and test assets (i.e., booster and AUR vehicles) preclude an assessment of all operational suitability metrics for the ARRW system. Specifically, there are insufficient data to assess the operational availability or the operational reliability in the captive-carry and free-flight configurations, with statistical confidence. However, the limited test data that the Air Force collected during ARRW test events indicate that the ARRW system is likely on track to meet all suitability requirements.

Preliminary results of survey responses from the Ops Demo indicate that personnel rated the ARRW training as adequate after completing additional qualification training to handle the ARRW munition. Preliminary results also indicate ARRW is supportable. After training, maintenance personnel were able to store and transport the ARRW, while aircraft armament personnel were able to upload and download the ARRW to a B-52H. Personnel rated the ARRW documentation (i.e., technical orders) as accurate and clear. No interoperability or compatibility issues were noted, although timeline limitations prevented some interoperability and compatibility testing.

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» **SURVIVABILITY**

The Air Force conducted engagement-level and mission-level simulations to assess ARRW survivability in a contested environment. The survivability assessment estimates the probability that a single ARRW will complete its mission, given the capabilities of various early warning radars, surface-to-air missile systems, and anti-aircraft-artillery batteries to detect and engage ARRW in various scenarios. Simulations indicate that ARRW will meet its survivability requirements.

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RECOMMENDATION

As recommended in the FY23 Annual Report, the Air Force should:

1. Verify, validate, and accredit all M&S tools intended for use to enable an adequate assessment of ARRW performance.