

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



DOT&E approved the Integrated Master Test Plan that governs the remaining testing for the AGM-183A ARRW program. The Air-launched Rapid Response Weapon (ARRW) program continues to develop and mature the ARRW prototype design and conduct testing to demonstrate the required warfighting capability. The program continues to show progress and has demonstrated safe separation from the platform, proper function of the solid rocket motor, shroud separation, glide vehicle separation and flight and warhead detonation. Activities continued in preparation for an operational demonstration is FY24.

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

Units utilize 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 a B-52H aircraft, ARRW provides standoff capability to prosecute targets in a timely fashion.

PROGRAM

ARRW is a rapid prototyping Middle Tier of Acquisition program leveraging technology and lessons learned from the Defense Advanced Research Projects Agency's Tactical Boost Glide vehicle program. In August 2023, the ARRW program completed an Integrated Master Test Plan and continues to develop an Operational Demonstration Plan for DOT&E approval. Having concluded a series of booster rocket flight tests in FY21–22, the program progressed into all-up round (AUR) testing with live warheads in FY23. Because of test range availability conflicts, the two ARRW AUR flight tests conducted in FY23 targeted broad ocean areas. The Air Force

intends to conduct land impacts for the last two AUR flight tests scheduled for FY24. The Air Force currently is producing a limited number of ARRWs. The Air Force will use the AUR flight test results to inform their production decision upon conclusion of the current test series.

» MAJOR CONTRACTOR

- Lockheed Martin Missiles and Fire Control – Orlando, Florida

TEST ADEQUACY

The program's flight test schedule is continually challenged due to the limited availability and numbers of hypersonic flight corridors, target areas, and test support assets. To continue system development efforts, the Air Force has conducted flight tests to date using broad ocean area impacts, which limited the amount of data collection for terminal flight and measurement of effects (i.e., lethality evaluation). The program continues to compete for limited flight test resources with other hypersonic programs, including those being developed by the Navy, Army, and Missile Defense Agency.

In December 2022, DOT&E observed the first AUR flight test. This test demonstrated proper function of the ARRW throughout all phases of flight that were measured, to include release from the B-52H platform, boost and ascent, booster-glide vehicle separation, glide, and terminal maneuver. The Air Force

experienced difficulties with the terminal phase telemetry and imagery, which prevented measurement of warhead function and effects.

In March and August of 2023, DOT&E observed two AUR test flights that demonstrated proper release of the ARRW from the B-52H platform and boost/ascent. Final data analysis is ongoing at this time; however, quick look data indicate nominal conditions, including flight of the glide vehicle and warhead detonation, were achieved.

The program intends to conduct additional testing in FY24. These flights will validate the envelope of the launch conditions as well as the ARRW's flight characteristics. AUR test flights will impact land targets.

The Air Force plans to conduct an operational demonstration to assess the operational capabilities and limitations of the system. The program is working with DOT&E to develop an Operational Demonstration Plan that governs the execution of the demonstration.

The Air Force continues to conduct analysis of test data that captures missile and glide vehicle flight characteristics, and warhead performance, and comparing the observed results to modeling and simulation (M&S) results. The various M&S tools that will be used to assess lethality against the full target set continue to be validated.

The Air Force plans to use engagement-level and mission-level M&S to assess ARRW

survivability against surface-to-air missile systems and anti-aircraft-artillery batteries.

PERFORMANCE

» LETHALITY

The ARRW program has shown preliminary indications that it could become an operationally lethal weapon; however, the lack of terminal characterization data to date does not yet allow for a full assessment.

In the December 2022 flight test, the AUR performed nominally in all aspects of flight. The lack of data regarding terminal conditions was not a fault with the ARRW itself, but rather a technical failure of the test range sensor systems used during the test. Due to these sensor system failures, it is unknown if the glide vehicle and warhead functioned as desired in the final phase of flight.

In the March 2023 flight test, the AUR incurred a failure when the shrouds failed to fully eject properly during booster-glide vehicle separation, as one of two shroud ejector motors appears to have not fired. Due to that failure, the Air Force could not obtain data for the glide and terminal phases of flight. The program instituted additional continuity verification to the ejector motors to avoid a similar failure in the future. Initial quick look data analysis indicates the flight test in August 2023 achieved nominal conditions, to include proper glide vehicle flight as well as warhead detonation.

The lethality evaluation will mainly rely on the data collected during the remaining AUR test flights, which are anticipated to terminate at land targets. Given the limited number of planned test events, there is a risk that the test program will not be able to demonstrate the ARRW lethal effects against the required tactical and strategic targets.

» SUITABILITY

The limited number of planned flight hours and test assets (e.g., booster and AUR) will preclude an adequate assessment of all operational suitability metrics for the ARRW system during this phase of testing. For example, the various intermittent failures within the overall weapon system are not currently meeting system specifications, but the Air Force continues to improve reliability with software and hardware fixes, along with process improvements in manufacturing.

» 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 one-on-one scenarios. Simulations to date indicate that ARRW will meet its survivability requirements.

RECOMMENDATIONS

The Air Force should:

1. Before the next flight test, adjudicate the DOT&E comments on the Operational Demonstration Plan and submit for DOT&E approval.
2. Verify, validate, and accredit all M&S tools intended for use to enable an adequate assessment of ARRW performance.