

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



Despite being under DOT&E oversight for over four years, the AGM-183A Air-Launched Rapid Response Weapon (ARRW) Program Office does not have a DOT&E-approved Integrated Master Test Plan nor has the Office submitted an Operational Demonstration Plan, but is proceeding to test the ARRW. The ARRW program has not yet demonstrated the required warfighting capability. The program conducted two successful flight tests demonstrating proper function of the solid rocket motor, shroud separation, and simulated glider separation. Hardware and software problems have delayed planned operational demonstration flights.

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 fixed, 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 Section 804 Rapid Prototyping Middle Tier of Acquisition program leveraging lessons learned from the Defense Advanced Research Projects Agency's Tactical Boost Glide vehicle program. The ARRW program is currently developing an Integrated Master Test Plan and an Operational Demonstration Plan for DOT&E approval. Having concluded a series of booster rocket flight tests in FY21 and FY22, the program plans to proceed into all-up round (AUR) testing with live warheads in FY23. All ARRW AUR tests will involve land impacts. The Air Force currently is producing a limited number ARRWs, with

four intended for AUR T&E. The Air Force will utilize the AUR test results to inform their production decision.

The program flight test schedule could be delayed due to the limited number and availability of hypersonic flight corridors, target areas, and test support assets. The program will be competing for these limited resources with other hypersonic programs, including those being developed by the Navy, Army, and Missile Defense Agency.

» MAJOR CONTRACTOR

- Lockheed Martin Corporation, Missiles and Fire Control Division – Orlando, Florida

TEST ADEQUACY

The draft ARRW Integrated Master Test Plan consists mostly of developmental ground and flight testing, and some live-fire lethality testing. The Air Force plans to execute an operational demonstration to assess the operational capabilities and limitations of the system, yet DOT&E has yet to see a completed Operational Demonstration Plan. The limited number of planned test assets and test targets will not allow an assessment of operational effectiveness (including lethality), suitability, and survivability with high confidence.

In May and July 2022, the program completed the second and third of three planned booster test flights with simulated gliders.

DOT&E observed the May test. The booster test flights demonstrated final weapon-aircraft integration with the production-representative missile, the capability to launch the weapon inside the flight envelope, and proper performance of the booster rocket. The program also completed the last of six warhead characterization arena tests in early FY22. Four AUR tests are scheduled, beginning in FY23.

The Air Force plans to use engagement-level and mission-level modeling and simulation (M&S) to assess ARRW survivability against surface-to-air missile systems and anti-aircraft-artillery batteries.

PERFORMANCE

» EFFECTIVENESS

Hardware and software problems have delayed planned ARRW operational demonstration flights, precluding an initial assessment of risks to demonstrating the ARRW's intended operational effectiveness requirements. The ARRW program executed two successful booster test flights in FY22.

During the first attempted booster test flight of FY22 (the second booster test flight for the program), the Air Force aborted the launch before release. A low voltage caused a built-in-test fault upon application of power, causing the weapon to prevent launch. The Air Force implemented software fixes to correct the issue and the second attempt of this booster test flight was successful. This test flight

demonstrated safe separation and deconfliction of the ARRW away from the B-52H bomber, achieved successful ignition of the solid rocket motor, and attained operational hypersonic speeds, culminating in a successful booster-glider separation event.

The second booster test flight of FY22 (third booster test flight for the program) was successful. The Air Force demonstrated the safe separation and deconfliction of the ARRW away from the B-52H bomber at a tactical deconfliction distance. It was launched in a different region of the launch envelope than the previous booster test flight. The second booster test flight also demonstrated maneuver of the ARRW toward a target.

Lethality testing is ongoing, precluding an initial assessment of ARRW warhead performance. Given the limited number of planned test events, there is risk to demonstrating the ARRW lethal effects against the required tactical and strategic targets.

» **SUITABILITY**

The limited number of planned flight hours and test assets (booster and AUR) will preclude an adequate assessment of all operational suitability metrics for the ARRW system during this phase of testing.

» **SURVIVABILITY**

The engagement-level or mission-level simulations have not yet been completed to assess ARRW survivability in a contested environment. Pending the verification, validation, and accreditation of the M&S tools, the final survivability assessment should estimate 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. The final survivability assessment should also estimate such probabilities in the presence of multiple threat systems connected by threat-representative

integrated air-defense systems capable of detecting, tracking, and engaging multiple airborne targets, including hypersonic weapons like the ARRW. Finally, ARRW only has an Authority to Operate; an assessment of ARRW's survivability within a cyber-contested environment is not currently scheduled, but should be completed before acquisition production decision.

RECOMMENDATIONS

The Air Force should:

1. Deliver an adjudicated Integrated Master Test Plan and Operational Demonstration Plan for DOT&E approval.
2. Verify, validate, and accredit all M&S tools intended for use to enable an adequate assessment of ARRW performance.
3. Conduct an adequate survivability assessment of ARRW in a cyber-contested environment.