

AGM-183A Air-Launched Rapid Response Weapon

The AGM-183A Air-Launched Rapid Response Weapon (ARRW) program has not yet demonstrated the required warfighting capability. The program conducted several developmental ground and flight tests demonstrating adequate interface integration with the B-52H aircraft. The program is implementing corrective actions within a series of rocket motor booster test flights. Hardware and software problems have delayed planned operational demonstration flights.



System Description

The ARRW is a conventional, 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. A standoff air-to-ground missile launched from a B-52H aircraft, the ARRW is intended to attack high-value, time-sensitive, land-based targets.

Program

ARRW is a Section 804 Rapid Prototyping Middle Tier of Acquisition program leveraging lessons learned from the Defense Advanced Research Projects Agency Tactical Boost Glide vehicle program. The program is currently developing an Integrated Master Test Plan and an Operational Demonstration test plan for DOT&E approval. After completion of the booster rocket flight tests, the program plans to proceed into all-up round (AUR) testing (including live warheads). The Air Force intends to complete at least one AUR test to determine if the system has reached an early operational capability state, before awarding a contract for production. The Air Force will consider transitioning the program from a Rapid Prototyping to a Rapid Fielding program after successfully deploying the ARRW residual capability.

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 Contractors

Lockheed Martin Corporation, Missiles and Fire Control (LMMFC) Division – Orlando, Florida. Boeing Aircraft Modernization and Sustainment – Oklahoma City, Oklahoma.

Test Adequacy

The ARRW Integrated Master Test Plan consists mostly of developmental ground and flight testing, and some lethality live fire testing. The Air Force plans to execute an Operational Demonstration using prototype AURs to assess the operational capabilities and limitations of the system. The limited number of test assets will not allow a standard assessment for operational effectiveness, lethality, suitability, and survivability.

In FY21, the program completed five instrumented measurement vehicle captive-carry flight tests to demonstrate initial weapon-aircraft interface integration, as well as proper fit and mechanical function of the weapon with the B-52H aircraft. The ARRW program twice attempted to execute one of the three planned booster test flights with a simulated glider. The booster test flights are intended to demonstrate 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. Four AUR tests will ensue upon the conclusion of booster flight testing.

The ARRW program executed one successful high-speed ground sled test to demonstrate warhead lethality performance against a variety of component-level targets. It continues to execute its series of six warhead arena tests needed to characterize the warhead fragment mass and velocity distribution in support of the ARRW lethality evaluation.

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, anti-aircraft-artillery batteries, and air-to-air missiles.

Performance

Effectiveness

Hardware and software problems have delayed planned ARRW operational demonstration flights, precluding an initial assessment of any risks to demonstrating the ARRW's intended operational effectiveness requirements. Instrumented

measurement vehicle captive-carry test flights validated the initial weapon-aircraft interface integration, confirmed aircraft mechanical fit and function data, and were used to develop and mature the software for the production-representative missile. These flight tests experienced two unexpected test events, which required a redesign of the fin control system. The Air Force validated all corrective actions in the final captive carry flight before proceeding into booster flight testing.

The first booster test flights experienced an unexpected test event on both attempts. During the first test, the missile, by design, did not separate from the B-52 because the system determined there was a fin actuator problem. The Air Force implemented a corrective action before the second attempt. During the second attempt, the missile experienced an unexpected test event after release from the B-52 aircraft that prevented the booster motor from igniting, leading to a loss of the test asset. The Air Force is currently conducting a Failure Review Board to determine the root cause(s) of the failure and implement corrective actions to the missile system before the next booster test flight. Although the second booster test experienced an unexpected event, it did demonstrate the safe release and separation of the weapon system from the aircraft. The second booster test also validated the fin actuator corrective action.

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 interim assessment of all ARRW operational suitability metrics.

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 capability of various early warning radars, surface-to-air missile systems, anti-aircraft-artillery batteries, and air-to-air missiles to detect and engage ARRW in various one-on-one scenarios. The final survivability assessment should also estimate such probability in the presence of multiple threat systems connected by a command, control, communications, and intelligence network capable of detecting, tracking, and engaging multiple airborne targets, including hypersonic weapons like the ARRW.

hypersonic Program Offices to identify and leverage common best practices, test corridors and infrastructure, test data management and analyses, and M&S capability.

2. Verify, validate, and accredit all M&S tools intended to enable an adequate assessment of ARRW performance.
3. Conduct an adequate survivability assessment of ARRW in a cyber-contested environment.

Recommendations

The Air Force should:

1. Collaborate with the Office of the Secretary of Defense stakeholders and the Army and Navy