

Excalibur XM982 Precision Engagement Projectiles

Executive Summary

- Paladin-equipped units in Operation Iraqi Freedom (OIF) have been using Excalibur since May 2007 to engage targets. As of October 2009, Field Artillery units have fired more than 76 rounds with reported accuracy better than 10 meters and 88 percent reliability.
- M777A2 Lightweight 155 mm Howitzer-equipped artillery units have been using Excalibur in Operation Enduring Freedom (OEF) since February 2008. As of October 2009, they have fired 38 projectiles with 82 percent reliability.
- Increment Ia-2 has demonstrated its effectiveness in GPS jamming and unjammed environments. It exhibits lower reliability at extreme cold and maximum propellant charges.
- The Army expects Excalibur to meet its reliability requirement before achieving Initial Operational Capability in September 2010.

System

- Excalibur is a family of precision-guided, 155 mm artillery projectiles.
- The Army is developing the High Explosive, Unitary Projectile (Increment I) in three spirals of increasing capability (Ia-1, Ia-2, and Ib).
- The projectiles are fin-stabilized and glide to their target. The Ia-1 projectiles use aerodynamic lift generated by canards to extend range out to 24 km. The Ia-2 and Ib projectiles add base bleed technology to further increase range to beyond 30 km.
- All variants use GPS and an Inertial Measurement Unit (IMU) to attack point targets with accuracy of less than 20 meters from the desired aim point.



Mission

- Field Artillery units will use Excalibur to provide fire support to combat maneuver units in all weather and terrain, including urban areas.
- Artillery units will use the High Explosive, Unitary Projectile (Increment I) to attack stationary targets in complex and urban terrain and to minimize collateral damage.

Prime Contractor

- Raytheon Missile Systems, Tucson, Arizona

Activity

Increment Ia-1

- The Army halted fielding of the FY07 production projectiles to OIF and OEF after a projectile flew back toward the firing position during a November 2008 Lot Acceptance Test.
- Units in OIF and OEF continued to use Increment Ia-1 rounds from the FY06 production lots, which were not affected by the safety problem in the FY07 lots.
- The Army isolated the FY07 lot deficiency to the IMU. The project manager selected a new IMU vendor and conducted a Design Verification Test in May 2008 and a Production Verification Test 2 in July 2009 to qualify the new IMU vendor and test corrective actions for additional failure modes.
- The Army resumed shipment of Increment Ia-1 projectiles to OIF and OEF in September 2009 following replacement of IMUs in all FY07 production lots.
- Paladin-equipped units in OIF have been using Excalibur since May 2007 to engage targets. As of October 2009, Field Artillery units have fired more than 76 rounds with reported accuracy better than 10 meters and 88 percent reliability.
- M777A2 Lightweight 155 mm Howitzer-equipped artillery units have been using Excalibur in OEF since February 2008. As of October 2009, they have fired 38 projectiles with 82 percent reliability.

ARMY PROGRAMS

Increment Ia-2

- In April 2009, the Army fired two Excalibur Increment Ia-2 projectiles at White Sands Missile Range, New Mexico, in the Guided-Gunfire 5 test. Both projectiles failed.
- Between April and July 2009, the Army fired 28 Increment Ia-2 projectiles in the second Sequential Environmental Test for Performance series at ranges from 9 to 35 km. GPS jamming was present for 26 of the 28 projectiles and the average miss distance from the aim point was less than 10 meters. Twenty-one projectiles performed properly resulting in 70 percent reliability in the test. Representative light material and plywood roof targets were used to provide additional data for the lethality evaluation.
- The Army has assessed Increment Ia-2 reliability at 81 percent following partial demonstration of the corrective actions for the failure modes common with Increment Ia-1 in the Design Verification Test and Production Verification Test 2 tests.
- The Army has scheduled additional testing for November and December 2009 to demonstrate additional corrective actions and build confidence in the corrective actions applied to Increment Ia-1.
- The Army postponed the Initial Operational Test until February 2010 due to a change in test unit and to ensure 85 percent reliability.

Increment Ib

- In September 2008, the Army awarded design and maturation contracts for full and open competition for Excalibur Increment Ib to reduce unit cost and improve reliability. The companies will evolve their proposed concepts then demonstrate them in a side-by-side live firing event in 2QFY10. The Army will then select a single contractor to

move forward with the qualification and initial production of the Increment Ib projectile.

Assessment

- Fielding Excalibur to artillery units in OIF in 2007 and OEF units in February 2008 has enhanced their ability to strike targets precisely while minimizing collateral damage. Increment Ia-1 has proven effective in combat even with limitations on its operational employment and less than required reliability. The new IMU resolved the safety issues with the FY07 lot.
- In developmental testing, the Excalibur Increment Ia-2 projectile demonstrated effectiveness against personnel, light material, and structure targets in jammed and unjammed environments.
- The program has identified reliability problems with Excalibur Increment Ia-2 in extreme cold (-45 degrees Fahrenheit) and when using the highest propellant charge (Modular Artillery Charge System zone 5). The Army expects the projectile to meet the reliability requirement before achieving its Initial Operational Capability in September 2010.

Recommendations

- Status of Previous Recommendations. The Army is making progress on DOT&E's previous recommendations.
- FY09 Recommendations. The Army should:
 1. Assess the operational impacts of Excalibur Increment Ia-2 if it does not achieve the reliability threshold requirements.
 2. Continue efforts to improve Excalibur reliability with Increment Ib.
 3. Articulate a credible lethality evaluation.