

Excalibur XM982 Precision Engagement Projectiles

Executive Summary

- The Army conducted the Excalibur Increment Ia-2 Initial Operational Test (IOT) at White Sands Missile Range, New Mexico, in February 2010 in accordance with DOT&E-approved test plans.
- Excalibur Increment Ia-2 is operationally effective and lethal. Excalibur Increment Ia-2 projectiles provide increased accuracy against point targets compared to unguided high-explosive artillery fires.
- Excalibur Increment Ia-2 allows cannon artillery units to effectively engage more point targets with better effects using fewer projectiles in complex urban terrain where standard unguided high-explosive projectiles cannot be used because of their ballistic dispersion.
- Overall, Excalibur Increment Ia-2 is operationally suitable. The projectile is reliable when fired with Modular Artillery Charge System (MACS) propellant charges 3 and 4, but is not reliable when fired with MACS propellant charge 5. Reliability shortfalls with MACS propellant charge 5 can be mitigated using straightforward tactics, techniques, and procedures.
- In August 2010, the Army selected Raytheon Missile Systems as the single contractor to move forward with the qualification and initial production of the Increment Ib projectile.

System

- Excalibur is a family of precision-guided, extended-range, 155-millimeter artillery projectiles.
- The Army is developing the high explosive, fragmenting projectiles (Block I) in three increments 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 kilometers. The Ia-2 projectiles add base bleed technology to further increase range to beyond 30 kilometers. The Army intends the Increment Ib projectiles to reduce costs and improve projectile accuracy, range, and reliability.

Activity

Increment Ia-1

- The Army continued fielding of Increment Ia-1 projectiles to Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF) in September 2009 following the replacement of IMUs in the FY07 production lots.
- Paladin-equipped units in OIF have been using Excalibur since May 2007 to engage targets. As of October 2010,



- 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 use Excalibur to attack enemy targets in support of maneuver operations at a greater range and with increased accuracy than standard high-explosive munitions.
- Field Artillery units use Excalibur to support the close fight in urban and complex environments, striking critical targets that must be engaged at extended ranges or in areas where minimal collateral damage is desired.

Major Contractor

Raytheon Missile Systems – Tucson, Arizona

- Field Artillery units have fired 87 projectiles with reported accuracy better than 10 meters and 87 percent reliability.
- M777A2 Lightweight 155 mm Howitzer-equipped artillery units have been using Excalibur in OEF since February 2008. As of October 2010, they have fired 115 projectiles with 87 percent reliability.

ARMY PROGRAMS

Increment Ia-2

- The Army conducted the Excalibur Increment Ia-2 Initial Operational Test (IOT) at White Sands Missile Range, New Mexico, in February 2010 in accordance with DOT&E-approved test plans.
- DOT&E completed an OT&E and LFT&E report in support of the Army's 2QFY11 full-rate production decision.
- The Army Vice Chief of Staff Capability Portfolio Review reduced the Increment Ia-2 procurement objective from 30,000 to 6,246 projectiles. This reduction caused a Nunn-McCurdy cost breach that delayed the Increment Ia-2 full-rate production decision from August 2010 to February 2011.
- The Army notified Congress of the Nunn-McCurdy breach in August 2010 and the program plans to complete recertification in January 2011.
- Excalibur Increment Ia-2 is operationally suitable. The projectile is reliable when fired with MACS propellant charges 3 and 4, but is not reliable when fired with MACS propellant charge 5. As demonstrated in the IOT, nine of 18 projectiles fired with MACS propellant charge 5 were not reliable and did not reach their target.
- The reduced reliability with MACS propellant charge 5 has minimal operational impact dependent upon the friendly forces locations and theater Rules of Engagement. Field Artillery units can achieve 98 percent of the 30-kilometer threshold range by using MACS propellant charge 4. The Army has updated their tactics, techniques, and procedures to account for the lower reliability when firing MACS propellant charge 5.

Increment Ib

- The Army awarded two design and maturation contracts for full and open competition for Excalibur Increment Ib, in September 2008. The goal of the program is to reduce unit price and increase reliability.
- The companies evolved their proposed concepts and demonstrated them in a side-by-side live firing event in June and July 2010.
- In August 2010, the Army selected Raytheon Missile Systems as the single contractor to move forward with the qualification and initial production of the Increment Ib projectile. The Increment Ib Milestone C is scheduled for 3QFY12.
- Excalibur Increment Ia-2 demonstrated poor reliability in extreme cold temperatures (-45 degrees Fahrenheit).
- Operational testing demonstrated unit leaders can use the command and control (C2) software to employ Excalibur Increment Ia-2. Current Forward Observer System C2 software does limit observer data entries when using Excalibur Increment Ia-2 against a single target with multiple aimpoints, resulting in increased fire mission processing timelines.
- Developmental and operational testing confirmed that with accurate target location, Excalibur Increment Ia-2 can meet its effectiveness requirements against countermeasured targets.

Assessment

Increment Ia-1

- Fielding Excalibur projectiles to artillery units in OIF in 2007 and OEF units in February 2008 has enhanced their ability to accurately strike targets while minimizing collateral damage. Army reporting from theater, reviewed by DOT&E, shows Increment Ia-1 has proven effective in combat even with limitations on its operational employment.

Increment Ia-2

- Excalibur Increment Ia-2 is operationally effective and lethal. Excalibur Increment Ia-2 achieved effects on 17 of 21 missions with a median miss distance of 3 meters for all reliable rounds during the IOT.
- Excalibur Increment Ia-2 is more lethal against personnel targets and some light material targets than standard high-explosive projectiles.

Recommendations

- Status of Previous Recommendations. The Army satisfactorily addressed all previous recommendations.
- FY10 Recommendations. The Army should:
 1. Improve Excalibur reliability with MACS propellant charge 5 during Increment Ib development in order to effectively achieve the objective range of 40 kilometers.
 2. Revise Forward Observer System and Advanced Field Artillery Tactical Data System software to incorporate a message format that accommodates multiple aimpoints for single calls for fire to reduce fire mission processing times.
 3. Continue testing Increment Ia-2 to determine Excalibur reliability at cold temperatures (between -45 degrees Fahrenheit and 0 degrees Fahrenheit).