

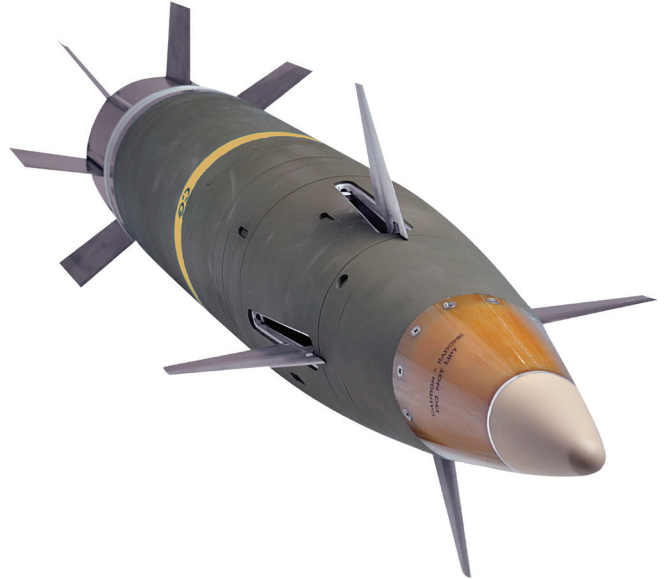
## Excalibur XM92 Precision Engagement Projectiles

### Executive Summary

- As of July 2012, the Army has fired 601 Excalibur Ia projectiles in operational theaters with the Program Office reporting 90 percent reliability.
- In February 2012, technical challenges with the Increment Ib projectiles caused reliability concerns with the base assembly. This resulted in the program changing the configuration of the Increment Ib projectiles.
- Excalibur Increment Ib is scheduled for a December 2012 Milestone C decision.

### System

- Excalibur is a family of precision-guided, extended-range, 155-millimeter artillery projectiles. The projectiles are fin-stabilized and glide to their target.
- The Army plans to develop three Excalibur variants:
  - High-Explosive, Unitary (Block I)
  - Smart (Block II)
  - Discriminating (Block III)
- All variants use GPS and an Inertial Measurement Unit (IMU) to attack point targets with accuracy of less than 10 meters from the desired aim point (in an unjammed environment).
- The Army is developing the High-Explosive, Unitary (Block I) projectile in three spirals of increasing capability (Ia-1, Ia-2, and Ib). The Ia-1 projectiles use aerodynamic lift generated by canards to extend range out to 24 kilometers without the maximum propellant charge. The Ia-2 and Ib projectiles add base bleed technology and use of the maximum propellant charge to further increase range to beyond 35 kilometers. The Army intends for the Increment Ib projectiles to improve reliability and reduce cost.



### 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

### Activity

#### Increment Ia

- Units in Operation Enduring Freedom (OEF) have been using Excalibur Increments Ia-1 and Ia-2 since February 2008. As of July 2012, Field Artillery units have fired 601 Excalibur projectiles in either Operation Iraqi Freedom or OEF.

#### Increment Ib

- In February 2012, technical challenges with the Increment Ib projectiles caused reliability concerns with the base assembly. This resulted in the program changing the configuration of the Increment Ib projectiles, reverting to the Ia spinning base assembly and warhead design.
- In June 2012, the contractor fired six Increment Ib projectiles in the contractor Gun Hardening P2 (GH P2) test at Yuma Test Center (YTC), Arizona, for reliability and accuracy testing. All GH P2 test projectiles reached their

targets with 2.9-meter median radial miss distance. All six projectiles reached their intended targets and detonated.

- In September 2012, YTC personnel fired 12 Increment Ib projectiles in developmental testing for Sequential Environmental Test-Safety 1 (SET-S1). All rounds completed environmental conditioning (logistic and tactical vibration and thermal soak) prior to firing, and were fired at pressures above the normal operational envelope. Two projectiles failed to guide and traveled to the ballistic impact point. Ten projectiles reached their targets with a 1.5-meter median radial miss distance.
- In October 2012, the Army fired 25 environmentally-conditioned projectiles at YTC to support validation of the ballistic firing tables, verify that Excalibur Increment Ib meets performance requirements, and provide

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live fire target assessment data (Sequential Environmental Test-Performance 1 (SET-P1)).

- The Increment Ib Milestone C decision is scheduled for December 2012, and the IOT&E is scheduled for April 2013.

## Assessment

### Increment Ia

- Excalibur Increment Ia-2 reliability in OEF is 90 percent (according to the Program Office) and Lot Acceptance Tests conducted in November and December 2011, and February 2012, had 24 of 24 reliable projectiles.

### Increment Ib

- Increment Ib has the same base and warhead as Increment Ia-2, and is expected to have the same terminal ballistic characteristics and lethality as Increment Ia-2.
- Since the GH P2 median radial miss distance is comparable to the Increment Ia IOT&E (unjammed) miss distance (3 meters), Increment Ib is anticipated to meet the 10-meter accuracy requirement and be as accurate as Increment Ia.
- Since external differences between Excalibur Increments Ia and Ib are minor and units are expected to use the

same tactics, techniques, and procedures, Increment Ib is anticipated to be as effective as Increment Ia.

- Of the 25 SET-P1 rounds fired, 22 hit the target with a median miss distance of 1.38 meters and 3 were duds. With regards to reliability, there were six failures in 31 rounds (including the GH-2 rounds). This gives a point estimate of 0.81 and a 21.8 percent confidence that they have met their growth curve target of 0.84. The program will need to complete root cause analysis before an assessment can be made as to whether the program can meet its 90 percent reliability requirement.

## Recommendations

- Status of Previous Recommendations. The Army is addressing the previous recommendations.
- FY12 Recommendations.
  1. The Army should continue Increment Ib reliability growth through completion of the developmental test.
  2. The program will need to complete root cause analysis before an assessment can be made as to whether the program can meet its 90 percent reliability requirement.