

Excalibur XM982 Precision Engagement Projectiles

Executive Summary

- The program continues to operate in accordance with the Excalibur Test and Evaluation Master Plan approved on May 27, 2005.
- Block 1a-1 Sequential Environment Test for Safety, Production Verification Testing, and First Article Testing occurred in 2006.
- A Limited User Test is scheduled for January - March 2007.
- Initial tests indicate accuracy and lethality requirements will be met.
- Excalibur reliability is improving as system developmental tests identify failure modes, which are being fixed by the program before further testing continues. The Army is working to overcome development and production challenges such as reliability, Future Combat System alignment, and integration.

System

- Excalibur is a family of precision-guided, 155 mm artillery projectiles.
- The Army is developing three variants:
 - High explosive, unitary (Block I)
 - Smart (Block II)
 - Discriminating (Block III)
- The Army will develop the high explosive, unitary projectile (Block I) in three spirals of increasing capability (Ia-1, Ia-2, and Ib).
- All variants use Inertial Measurement Unit guidance and Global Positioning System (GPS) technology to achieve enhanced accuracy to impact less than 10 meters from the desired aim point.
- The projectiles are fin-stabilized and will attack point targets to ranges beyond 30 kilometers.



Mission

Artillery units will use Excalibur to provide fire support to combat maneuver units in all weather and terrain, including urban areas.

- The high explosive, unitary projectile (Block I) will be used to attack stationary targets in complex and urban terrain, while minimizing collateral damage.
- The Smart projectile (Block II) will engage moving and time sensitive targets.
- The Discriminating projectile (Block III) will search, detect, and selectively engage individual vehicles by distinguishing specific target characteristics.

Activity

- The contractor completed the Guided Gunfire B developmental test series, firing 17 tactical projectiles against realistic target arrays and a structure target. Guided Gunfire B tests identified several design and production-induced failure modes that the developer addressed.
- The developmental test program also included 15 fully tactical, environmentally-conditioned rounds in a Sequential Environmental Test for Safety. This test series identified vibration-induced faults that require the Block Ia-1 projectile to be transported in containers in tactical support vehicles.
- The program completed Block Ia-1 Ballistic Discard Stability and Warhead Fail Safe tests to ensure projectiles that fail to guide properly do not detonate when they impact.

Assessment

- Excalibur projectiles demonstrated required accuracy, lethality, and the ability to perforate a 4-inch concrete roof under realistic firing conditions.
- The Excalibur program must address further development and production challenges, such as:
 - Continuing coordination with the Future Combat System Non-Line-of-Sight Cannon program to maintain compatibility as the Non-Line-of-Sight Cannon design matures
 - Improving reliability and ramping up production rates
 - Integrating the Enhanced Portable Inductive Artillery Fuze Setter onto U.S. cannon systems

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- Ensuring rounds that do not achieve GPS-aided flight impact in predicted safe areas
- Production of a reliable Inertial Measurement Unit
- Enhancing GPS acquisition
- Integrating base bleed technologies to achieve extended ranges
- Maturing the manufacturing process; manufacturing problems are partially responsible for low reliability and include failures such as corrupted Inertial Measurement Units, inadequately torqued joints, and faulty sealants
- Environmental tests identified vibration-induced faults that require Block Ia-1 projectiles be transported in containers in tactical support vehicles. This makes Excalibur operational employment less flexible.
- The aggressive Spiral Ia-1 schedule contained little time for failure analysis and implementation of corrective actions. This resulted in delays of the Urgent Materiel Release when failures occurred.
- There is significant risk to achieving required performance during GPS jamming.
- The smart and discriminating projectiles, which are scheduled for Milestone C decisions in FY13, incorporate target discrimination capabilities. Previous efforts to field smart projectiles have been successful against benign targets, but have been less successful against targets that employ active and passive countermeasures.

Recommendations

- Status of Previous Recommendations. The Army is currently adhering to DOT&E's recommendations from last year, but schedule pressures remain to achieve an Urgent Materiel Release for Block Ia-1 as soon as possible. The following FY05 recommendations remain valid:
 - FY05 #1: Testing should remain event-driven. Failure to meet specific Army entrance and exit criteria specified in the Test and Evaluation Master Plan prior to progressing to the next stage of testing will add program risk.
 - FY05 #2: The Army should incorporate operational realism into the developmental testing whenever possible to reduce program risk. This includes using advanced target location software, soldiers as forward observers, fire direction personnel, and gun crews.
- FY06 Recommendation.
 1. The Army should continue ongoing efforts to capitalize on operational use of other precision-guided weapons (Guided Multiple Launch Rocket System – Unitary) to further develop and refine procedures for targeting, sensor-shooter links, airspace management, and command and control in order to exploit the enhanced accuracy of Excalibur.