



# EXCALIBUR

## PRECISION ACCURACY AT EXTENDED RANGES

*“When I would tell my targeteers to take out a specific building (in Iraq), they would ask me, ‘Sir, do you want the rubble in the front yard or back yard?’ Now that’s ‘precision.’”*

*— LTG Thomas Metz, CG III Corps*

By MAJ Annette C. Merfalen

Since Operation Desert Storm, the United States military forces have been revolutionizing their operational concepts, shifting from being weapons dependent to effects-based planning and operations. Procedures shifted from planning for the number of sorties required to destroy a single target, to planning the number of targets that can be destroyed with a single sortie and the combined effect from that attack. During Operation Iraqi Freedom, approximately 66 percent of U.S. munitions used were precision-aided, either by Global Positioning System (GPS), by laser or both. The development of new tactics to find, fix, track, engage and assess targets resulted in Space operations being better integrated into operational planning and mission execution. The Army’s most recent operations have reinforced the need for responsive precision attack of critical point targets, to include those in urban environments or restrictive terrain and under all weather conditions, all while minimizing collateral damage.

U.S. troops in Iraq and Afghanistan could have a significantly more accurate howitzer-fired munition by the end of Fiscal Year 2006, according to officials. The Excalibur XM982 155mm Howitzer round, developed by Raytheon and Bofors Defense, is the next generation family of projectiles for the U.S. Army and U.S. Marine Corps Artillery. Excalibur will be the Army’s first precision, satellite guided, fire-and-forget indirect-fire family of munitions. Excalibur will be used in Army and Marine Corps howitzers, to include the M109A6 Paladin, the M777 Lightweight 155 Howitzer and the Future Combat

Systems’ Non-Line-of-Sight-Cannon (NLOS-C). Using the M777 155 mm howitzer, a two-man crew can fire one round every ten seconds, maintaining a sustained rate of six rounds per minute, out to a range of 30 kilometers.

Numerous live fire tests at Yuma Proving Grounds, Ariz., had Excalibur firing munitions at targets out to 20 kilometers. During a September live fire demonstration, an Excalibur hit a target 15 kilometers away, detonating within seven meters of the target. “Excalibur will reduce collateral damage, increase survivability of friendly troops and accomplish the mission more efficiently,” according to COL Ole Knudson, the project manager for Army combat ammunition systems. Excalibur is accurate to within 10 meters circular error probable at any range in its operational sequence. This indicates a significant improvement over existing munitions, reducing collateral damage and permitting its use close to friendly units, thus increasing employment flexibility as well as reducing the number of rounds required to perform any lethal artillery mission. The table on page 23 illustrates the capability of Excalibur to use fewer rounds against various point targets as compared to the M549 155mm Rocket-Assisted Projectile and M107 155mm HE projectile (both fired from the M198 howitzer).

Excalibur’s fragmenting steel warhead, combined with a near-vertical terminal trajectory enables the round to achieve greater lethality than current HE rounds. Excalibur uses three fuse settings — airburst, point detonation and delay. The airburst or height of burst fuze setting will enable Soldiers and Marines in contact to engage enemy forces on rooftops and

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THE "ROUND" TABLE

	Excalibur 155mm Unitary (At any range out to 40 Km)	M549 155mm RAP (20 Km Range to Target)	M107 155mm HE (15 Km Range to Target)
Infantry Platoon	3 rounds	25 rounds	43 rounds
Radar	1 round	10 rounds	11 rounds
Command Post	6 rounds	54 rounds	78 rounds
Structure	3 rounds	147 rounds	110 rounds

in windows. The delay fuse will be ideal for penetrating structures and command posts. The point-detonating fuse will be effective against personnel and light materiel targets, such as dismounted troops and weapons crews, air defense systems, radars, and light armor and wheeled vehicles.

GPS navigation and guidance provides an effective, low cost means for aiding precision targeting. The Excalibur unitary round contains a GPS receiver and Inertial Measurement Unit which monitors the weapon's locations and altitude to adjust its flight path to accurately impact on the target. Once fired, spinning base fins deploy to stabilize the round. Horizontal stabilizers, or canards, deploy reducing the round's roll-rate or spin. This allows the round to orient its GPS antennas toward the satellite constellation for rapid acquisition of the GPS signals, enabling the round to maneuver to the target. Excalibur's GPS receivers and guidance components make corrections along the guided portion of the firing trajectory, optimizing its range. GPS position coordinates are updated throughout the round's flight, steering the round to the target. In the event the GPS signal is jammed during the flight, the Inertial Measurement Unit will use the last GPS data received to guide the round to the target. As it nears the target, the

round will orient itself to an almost perpendicular angle of attack to the target, optimizing the blast effects. The fuse will function according to the option selected, detonating the round on the target.

The Army is well down the path of transforming its operational concepts to more efficiently and effectively deny the enemy safe haven. Excalibur's responsiveness to timely, precision engagements for use in an urban setting will change the dynamics of today's contemporary operating environment, allowing commanders the flexibility to engage the enemy at a time and place of their choosing, with greater accuracy all the while limiting collateral damage.

*Information contained in this article is derived from multiple sources, including the Excalibur Project Manager, TSM Canon, the Field Artillery Journal, Army News Service Online and the Defense Update-International Online Magazine.*

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