Future Combat Systems (FCS) Manned Ground Vehicles: Non-Line-of-Sight Cannon (NLOS-C)

Executive Summary

- Between June 2005 and February 2006, the Non-Line-of-Sight Cannon (NLOS-C) Demonstrator tested a 38-caliber cannon tube similar to that expected in the final design. Adopting a 38-caliber cannon tube results in NLOS-C having approximately the same range with most munitions as the current M109A6 howitzer.
- The NLOS-C Demonstrator also revealed that a lightweight platform can provide enough stability to mount and fire a 155 mm cannon.
- By the time the NLOS-C Demonstrator ended testing in February, it had fired 2,057 rounds and achieved a sustained rate of fire of six rounds per minute. The current Paladin howitzer has a maximum rate of fire of four rounds per minute for three minutes and a sustained rate of fire of one round per minute thereafter.
- Achieving a weight that supports deployment of three NLOS-C howitzers on a C-17 will be difficult without affecting operational effectiveness, survivability, or suitability.
- It may be a significant challenge for NLOS-C, with an automated ammunition handling system, to meet its reliability requirements.

System

- NLOS-C is a tracked, self-propelled, hybrid-electric drive 155 mm howitzer with a two-man crew.
- It is the lead vehicle for the manned ground systems in the Future Combat Systems (FCS).
- The Army will:
  - Procure six to eight prototypes in 2008 for testing
  - Procure 18 Block 0 systems in FY10-12 for limited fielding and experimentation
- The cannon will fire 6 rounds per minute to ranges of 30+ kilometers.
- NLOS-C units are expected to achieve improved accuracy, even with unguided projectiles. For example, when attacking a target at 20 km, 50 percent of unguided rounds must land within 110 meters of the aim point.
- NLOS-C equipped units are expected to respond to fire mission requests within 20 seconds when stationary and within 30 seconds when moving.

Mission

- NLOS-C units are designed to provide cannon fires in support of FCS Brigade Combat Teams and other mechanized brigade combat teams.
- NLOS-C is intended to fire the entire suite of Army 155 mm munitions, including Excalibur precision munitions, to attack point targets.
- NLOS-C is a member of the FCS family of Manned Ground Vehicle (MGV) systems. Three MGV systems are designed to be deployable on one C-17 aircraft (before installing extra protective armor) to support early deploying forces with cannon fires.

Activity

- In May 2006, OSD approved an update to the FCS Test and Evaluation Master Plan (TEMP). The TEMP did not address NLOS-C Block 0 production. The Army was directed to add the NLOS-C Block 0 information within 180 days.
- The Army intends to deploy three FCS vehicles on a single C-17 aircraft. In 2006, the Army approved a 27.4-ton weight allowance for all FCS MGVs.
- Between June 2005 and February 2006, the NLOS-C Demonstrator tested a 38-caliber cannon tube similar to that expected in the final design. When testing ended in February, NLOS-C had fired 2,057 rounds and achieved a sustained rate of fire of 6 rounds per minute.
- With Design Review 3 (July - September 2006), the Army matured the design and completed a series of design

reviews for NLOS-C Increment 0. Increment 0 will use the best technical approach design for testing the chassis and armament, but will have limited or surrogate communications, survivability, crew station, and energy subsystems.
- Yuma Proving Grounds, Arizona, completed upgrades to the NLOS-C test sites that received the NLOS-C Firing Platform in October 2006. The Firing Platform will have a mission module that is nearly identical to the Increment 1 design, but mounted on a surrogate chassis with no automotive equipment and electronics located in an adjacent structure rather than on the platform. The Army will use the Firing Platform for risk reduction in cannon and mount development, safety certification, and reliability growth of the mission module.
- Mission Equipment Integration Test Stands began operation in May 2006 to support subsystem checkout and control algorithm development for the Firing Platform and Increment 0 mission equipment.

Assessment
- NLOS-C is one member of the FCS family of MGV systems. Achieving a weight that supports deployment of three MGV systems on one C-17 may be difficult without affecting operational effectiveness, survivability, or suitability.
- Adopting a zone 4 cannon chamber with a 38-caliber cannon tube reduces the range of most munitions by 3-5 kilometers when compared to the zone 5 cannon chamber with a 39-caliber tube previously tested. As a result, NLOS-C will have approximately the same range with most munitions as the current M109A6 howitzer.
- It will be a challenge for a two-man crew to conduct continuous 24-hour operations while performing operational missions, maintenance, resupply, and security associated with combat operations.
- The reliability requirement of 512 hours mean time between system aborts is more than an eight-fold increase over the reliability requirement for the Crusader system that was cancelled in 2002. Likewise, it is over 8 times the 62-hour requirement that the current Paladin howitzer was required to achieve at its operational testing in 1992. It will be a significant challenge for NLOS-C, with an automated ammunition handling system, to meet its 512-hour requirement.
- The Army has not yet developed an adequate test and evaluation strategy to support fielding of NLOS-C Block 0 production howitzers.
- Assessing the effectiveness of NLOS-C, within the FCS system-of-systems, will require an adequate real-time casualty assessment system that can accurately determine the impact of indirect fires on combat operations.

Recommendations
- Status of Previous Recommendations. The Army should address the FY05 recommendations, which remain valid for FY06.
  FY05 #1. The Army should ensure that FCS operational test plans include adequate NLOS-C firing exercises. Supported maneuver units will need opportunities to demonstrate that they can plan and coordinate fires, and the NLOS-C units will need to demonstrate they can sustain operations while delivering accurate and timely fires.
  FY05 #2. The Army should develop a real-time casualty assessment system for indirect fires that can accurately assess the effectiveness of NLOS-C fires in system-of-system exercises.
  FY05 #3. The Army should develop a test and evaluation strategy to support the fielding of NLOS-C Block 0 production howitzers, scheduled to begin in FY10.
- FY06 Recommendations. None.