Early Infantry Brigade Combat Team (E-IBCT) Class 1 Block 0 Unmanned Aircraft System (UAS)

Executive Summary

- The Under Secretary of Defense for Acquisition, Technology, and Logistics (USD (AT&L)) granted Milestone C approval for Early Infantry Brigade Combat Team (E-IBCT) Increment 1 on December 24, 2009. The decision included approval for Low-Rate Initial Production (LRIP) of equipment for one E-IBCT.
- The Class 1 Block 0 Unmanned Aircraft System (UAS) is one of the planned E-IBCT Increment 1 capabilities.
- The Army has undertaken an extensive corrective action program to fix the failure modes discovered during FY09 testing and to increase reliability of the Class 1 Block 0 UAS.
- The Army Test and Evaluation Command (ATEC) conducted a Limited User Test (LUT 10) at White Sands Missile Range, New Mexico, in September 2010. LUT 10 was the second operational test of the E-IBCT systems and was intended to assess progress in E-IBCT operational effectiveness and suitability in a realistic operational environment.
- Based upon analyses of the results from LUT 10, DOT&E's current assessment of the Class 1 Block 0 UAS is that it did not demonstrate an adequate level of performance to be fielded to units and deployed in combat.

System

- The Class 1 Block 0 UAS design originates from the gasoline Micro Air Vehicle developed by the Defense Advanced Research Projects Agency.
- The Army intends to employ the Class 1 Block 0 UAS at the company/platoon level.
  - The Army intends the system to be man-portable in two custom Modular Lightweight Load-carrying Equipment packs weighing no more than 56 pounds each.
  - The flight endurance time is 40 minutes with a forward airspeed of up to 40 knots.
  - The aircraft can be launched in winds up to 15 knots and once airborne, operate in winds up to 20 knots at an altitude of 500 feet above ground level with a range of 4 kilometers.
- The Class 1 Block 0 UAS consists of an aircraft with a five horsepower gasoline-fueled ducted fan engine, a ground data terminal, an operator control unit, gimbaled payloads (electro-optical or infrared), avionics pod, digital data link radios, electric fueler, and support equipment.
- The electro-optical pod and infrared pod payloads are interchangeable sensors. The Class 1 Block 0 Aircraft can carry one sensor at a time.
- The Class 1 Block 0 UAS takes off and lands vertically, and once airborne, uses both autonomous and manual flight mode navigation.

Mission

Companies and platoons employ the Class 1 Block 0 UAS to conduct reconnaissance, surveillance, target acquisition, and force protection missions in support of operations in open, rolling, under-canopy terrain, and urban environments.

Major Contractors

- Prime/Lead System Integrator for E-IBCT: The Boeing Company, Integrated Defense Systems – St. Louis, Missouri
- Class 1 Block 0 UAS: Honeywell, Aerospace Division – Albuquerque, New Mexico

Activity

- The USD (AT&L) granted Milestone C approval for Early Infantry Brigade Combat Team (E-IBCT) Increment 1 on December 24, 2009. The decision included approval for Low-Rate Initial Production (LRIP) of equipment for one E-IBCT. As part of this decision, USD (AT&L) directed a second Defense Acquisition Board (DAB) be scheduled for December 2010 for an LRIP decision for the remainder of the E-IBCT program.
- The Class 1 Block 0 UAS is one of the planned E-IBCT Increment 1 capabilities.

- Since the Milestone C decision, the E-IBCT program has pursued an intensive effort to fix reliability deficiencies for all E-IBCT systems that were identified in operational and developmental testing in 2009. The program conducted Technical Test 1 (TT-1), a contractor/government developmental test, in July 2010 at White Sands Missile Range, New Mexico, to assess improvements in reliability.
- ATEC conducted LUT 10 at White Sands Missile Range, New Mexico, in September 2010 in accordance with the DOT&E-approved test plan. LUT 10 was the second operational test of the E-IBCT systems and was intended to assess progress in E-IBCT operational effectiveness and suitability in a realistic operational environment. During LUT 10, an infantry battalion consisting of two infantry companies equipped with E-IBCT systems executed a series of offensive, defensive, and stability missions during three 96-hour scenarios. The results of LUT 10 will be used to inform a DAB decision to purchase an additional two E-IBCTs as part of LRIP.

Assessment

- The Class 1 Block 0 has the capability to vertically launch, hover, and stare, and is best suited for complex urban terrain.
- During TT-1, the Class 1 Block 0 UAS demonstrated 107 hours Mean Time Between System Abort (MTBSA), exceeding its requirement of 23 hours MTBSA. It demonstrated 9.73 hours Mean Time Between Effective Function Failures (MTBEFF), not meeting its requirement of 11 hours MTBEFF. Effective Function Failures are less severe than system aborts, representing degradation in system performance as opposed to rendering the system unusable. The MTBEFF results reflect the program's priority on fixing the system aborts, which are the most serious failure modes.
- During LUT 10, the Class 1 Block 0 UAS provided some reconnaissance and surveillance support demonstrating limited tactical utility. The system's most significant contributions came during defensive operations. The air vehicle flight and sensor performance met most user requirements. Class 1 Block 0 UAS has limited range and endurance and is not reliable. Class 1 Block 0 UAS reliability demonstrated during the LUT (3.11 hours MTBSA and 2.57 MTBEFF) is well short of user threshold requirements (23 hours MTBSA and 11 hours MTBEFF), and has demonstrated little improvement over last year's LUT 09 performance (1.5 MTBSA and 1.47 MTBEFF).
- During LUT 10, the Class 1 Block 0 UAS experienced 19 system aborts. Three (16 percent) may be attributed to lost link and four (21 percent) to the fuel system design and fueling procedures. The lost link failures may be due to a loss of line-of-sight capability between the aircraft and the Ground Data Terminal. The four fueling-related failures corresponded with four aircraft crashes, potentially because there is no fuel gauge or fuel level sight glass on the aircraft. When preparing an aircraft for launch, the operator must know how much fuel is in the aircraft and manually adjust the starting fuel level within the operator control unit (OCU). The OCU then calculates the remaining fuel on board during the flight. Because the aircraft does not have a fuel gauge or fuel level sight glass and the operator must manually enter the amount of fuel estimated to be in the aircraft, the aircraft may be launched with less or more fuel on board than the operator believes.
- During LUT 10, the unit did not employ the system as a man-portable, on-the-move system, as the Army operational concept intends. The system is heavy, bulky, and hard to transport and was never backpacked during the LUT.
- System set-up to pass images through the Network Integration Kit is time-consuming and was not used with regularity during LUT 10. File compression of images taken by the Class 1 Block 0 to facilitate passage through the network degrades image quality.
- The Army has not reduced the acoustic signature of the aircraft. The Class 1 Block 0 UAS can be heard and seen from 2 and 4 kilometers respectively.
- Reliability and durability of the aircraft continues to be poor.
- Based upon analysis of the results from LUT 10, DOT&E's current assessment of the Class 1 Block 0 UAS is that it did not demonstrate an adequate level of performance to be fielded to units and deployed in combat.

Recommendations

- Status of Previous Recommendations. The Army addressed two of the six FY09 recommendations. Recommendations concerning assessing manpower requirements of the system and whether or not assigning it as a battalion asset, rather than a company/platoon level asset, would be more effective and suitable; reducing the acoustic and visual signature of the aircraft; improving the reliability and durability of the aircraft; and reducing the weight of the electric fueling system remain.
- FY10 Recommendations. The Army should:
  1. Improve the range, endurance, and reliability of the Class 1 Block 0 UAS.
  2. Reduce the aural signature of the aircraft.
  3. Consider including a telescopic Ground Data Terminal antenna to improve line-of-sight capability between the aircraft and the Ground Data Terminal.
  4. Consider a sight glass or fuel gauge capability for fueling the UAS.
  5. Consider reducing the weight of the Class 1 Block 0 UAS to improve the transportability of the system in the backpack configuration.
  6. Improve the capability to pass images through the network without degrading image quality.