B61 Mod 12 Life Extension Program Tail Kit Assembly

Executive Summary

- The B-61 Mod 12 (B61-12) Life Extension Program (LEP) Tail Kit Assembly (TKA) completed DOD developmental testing and continues Department of Energy (DOE) system qualification testing.
- The TKA demonstrated high degrees of accuracy and reliability in testing to date with no reliability failures.
- The Air Force executed a Milestone C decision on October 26, 2018.
- Operational testing is scheduled to begin 2QFY19, contingent upon:
  - Delivering operationally representative Bomb Assemblies (BA) on time
  - Releasing updated F-15E mission planning software
  - DOT&E accepting a mix of B61-12 Weapons Control Units (WCU) using a Field Programmable Gate Array (FPGA) or Application-Specific Integrated Circuit (ASIC) chips as production representative

System

- The Nuclear Weapons Council (NWC)-directed B61-12 LEP entails the consolidation of four legacy B61 variants (Mods 3, 4, 7, and 10) into a single variant featuring a limited-life component upgrade to the BA and integration with a new TKA.
- The TKA is a subassembly of the B61-12 All-Up-Round (AUR) and will be tested in accordance with DOD Instruction (DoDI) 5000.02 requirements. The B61-12 DOE activities are led by the National Nuclear Security Administration (NNSA), and the BA subassembly will be tested and qualified per activities defined in the NWC Procedural Guideline for the Phase 6.X Process. When mated, the BA and TKA constitute an AUR, which will be qualified in accordance with the B61-12 System Qualification Plan.
- The TKA is designed to be mechanically mated and electrically connected to the nuclear BA and provides the B61-12 with a guide-to-target capability (System 2), while retaining the legacy ballistic flight capability (System 1).
- Controlled guidance is achieved via pre-programmed target location data being provided as inputs to the TKA guidance, navigation, and control (GNC) system. The TKA design does not include a GPS receiver.

Mission

The B61 thermonuclear bomb family is a key component of the current U.S. nuclear deterrence. A unit equipped with the air-delivered B61-12 nuclear weapon plays a critical role in supporting the airborne leg of the nuclear triad for the United States and allies abroad.

Major Contractor

Boeing Defense, Space & Security – St. Louis, Missouri

Activity

- The Air Force conducted developmental testing in accordance with a DOT&E-approved Test and Evaluation Master Plan (TEMP) for the B61-12 LEP TKA. DOT&E approved an updated TEMP in support of the Milestone C decision on October 26, 2018.
- The Air Force completed the developmental test phase in FY18 with the release of 16 free-flight weapons and completion of developmental cybersecurity testing. Over the past 2 years, the B61-12 LEP TKA has flown 22 free-flight weapon releases as part of TKA developmental testing.
- Reliability testing included the 22 developmental test releases and 9 additional DOE/NNSA system qualification flight tests.
- Results from the TKA developmental testing, supplemented with system qualification test results, will support an Operational Test Readiness Review (OTRR) in 2QFY19. The Air Force has scheduled B61-12 LEP TKA operational testing following the OTRR with initial events occurring in February 2019 and flight tests starting in March 2019. These dates are approximately 3 months later than previously

planned because of production delays with parts of the BA subassembly resulting in delivery slips for B61-12 AURs.
- In FY18, Sandia National Lab conducted comparison testing between two different versions of the WCU to determine if there are any performance differences between those WCUs containing an FPGA chip and those containing an Application-Specific Integrated Circuit (ASIC). This comparison testing is required for DOT&E to determine if FPGA-equipped BAs are production representative for use in IOT&E. Analysis is ongoing and expected to be complete prior to the end of CY18.

Assessment
- Air Force developmental testing of B61-12 LEP TKA is complete and system qualification testing is ongoing. Preliminary results to date indicate:
  - The TKA demonstrates high reliability, availability, and accuracy. There have been no reliability failures during flight test and all weapons have hit inside the system accuracy requirement.
  - One system component presents a cybersecurity vulnerability, but mitigation or elimination of the vulnerability appears feasible without a major investment of time or money.
- WCU comparison test data will allow DOT&E to determine if the current planned test articles with two different versions of the WCU are production representative for the purpose of IOT&E.
- While production appears to be sufficient to meet the current scheduled IOT&E completion date, delayed delivery of operational test articles will require a more aggressive test pace. A delay in the delivery of updated F-15E mission planning software to enable the planning of loft delivery missions could also affect the timely completion of operational testing.

Recommendations

The Air Force must:
1. Resolve the outstanding cybersecurity issues during the operational test period.
2. Deliver the F-15E mission planning software before the first scheduled F-15E mission.