AC-130J Ghostrider

Executive Summary

- U.S. Special Operations Command (USSOCOM) is developing AC-130J through the integration of a modular Precision Strike Package (PSP) onto existing MC-130J aircraft. The PSP was previously developed and tested on several AC-130W aircraft since 2009.
- The AC-130J first flight was in January 2014.
- Developmental testing and evaluation (DT&E) identified several problems that require resolution and have delayed the operational assessment supporting the Milestone C decision by approximately four months.
- The U.S. Air Force Combat Effectiveness and Vulnerability Analysis Branch completed an initial qualitative survivability study of legacy aircraft to support the detailed AC-130J survivability analysis and evaluation plan development as laid out in the Live Fire Alternative Test Plan.

System

- The AC-130J is a medium-sized, multi-engine, tactical aircraft with a variety of sensors and weapons for air-to-ground attack.
- USSOCOM is developing AC-130J through the integration of a modular PSP onto existing MC-130J aircraft. USSOCOM continues to develop new PSP capabilities in parallel on legacy AC-130W aircraft prior to introduction on the AC-130J.
  - The current PSP provides a weapons suite composed of a 30 mm side-firing chain gun; wing-mounted, GPS-guided Small Diameter Bombs; and Griffin laser-guided missiles mounted internally and launched through the rear cargo door.
  - The PSP also provides an Intelligence, Surveillance, and Reconnaissance suite composed of two electro-optical/infrared sensor/laser designator pods; a synthetic aperture radar pod; and multiple video, data, and communication links. All PSP subsystems are controlled from a dual-console Mission Operator Pallet (MOP) in the cargo bay, with remote displays and control panels (including master arm and consent switches and a gun trigger) on the flight deck.
  - The program intends to add a 105 mm gun beginning with aircraft #3 (scheduled to complete modification in mid-FY16). Partially, as a result of this, the crew complement will increase from seven to nine, and some crew responsibilities will change.
  - Future updates will add a laser-guided variant of the Small Diameter Bomb, and wing-mounted laser-guided HELLFIRE missiles.
- The AC-130J will retain the ability to be refueled in flight, but it will not retain the external hose-and-drogue pods used to refuel other aircraft.
- The AC-130J retains all survivability enhancement features found on the HC/MC-130J aircraft. Susceptibility reduction features include the AN/ALR-56M radar warning receiver, AN/AAR-47(V)2 missile warning system, and AN/ALE-47 countermeasures dispensing system. Vulnerability reduction features include fuel system protection (fuel tank foam to protect from ullage explosion), redundant flight-critical components, and armor for crew and oxygen supply protection.
- The AC-130J will replace legacy AC-130H/U aircraft.

Mission

The Joint Task Force or Combatant Commander will use:

- The AC-130J to provide persistent and precision strike operations, including close air support, air interdiction, and armed reconnaissance.
- The AC-130J sensor, data, and communications suite to provide battlespace wide area surveillance and situational awareness; execute non-traditional Intelligence, Surveillance, and Reconnaissance operations; and support combat search and rescue operations.

Major Contractor

Lockheed Martin – Bethesda, Maryland

Activity

- DT&E began with ground tests on the first aircraft in October 2013 while integration was being completed; flight tests began in January 2014.
- The Air Force USSOCOM delivered the second MC-130J for conversion to an AC-130J in September 2014.
- The program selected a different intercommunication system for aircraft #2. This change, as well as delayed delivery of the necessary government-furnished information and equipment to the integrating contractor, has caused a projected two- to three-month delay in availability of aircraft #2 for testing.
- The LFT&E Integrated Program Team has drafted the Ballistic Vulnerability Analysis, the Anti-Aircraft Artillery Susceptibility Analysis, and the Proximity Burst Analysis plans. The team reviewed and summarized the available legacy aircraft survivability data to provide a more informed and more efficient set of analysis plans specifically tailored to the AC-130J Concept of Operations. The execution of these plans is expected to begin in 1QFY15.

Assessment

- DT&E identified several problems that require resolution and will affect the subsequent development test schedule:
  - In February 2014, during flying and handling qualities testing near the stall limit, the aircraft experienced a temporary departure from controlled flight. The recovery maneuver exceeded some speed and load limits on the aircraft. Flight testing was suspended for aircraft inspections and a safety incident investigation. Upon return to flight, testing was added to the DT&E plan to characterize the flight envelope more carefully. This will delay completion of DT&E by approximately two months.
  - Problems integrating the PSP weapon kit onto the aircraft continue to delay portions of developmental testing by prohibiting weapons employment.
    - The visual acuity of the electro-optical/infrared sensors installed on the AC-130J is not sufficient for accurate target identification and designation because the new aircraft causes more vibration than the legacy AC-130W aircraft on which the PSP was previously installed.
    - Electrical/radio-frequency interference between aircraft systems and the hand controllers used by crewmembers to direct the sensors and weapons has caused erratic sensor movements. This inhibits target tracking and is a safety hazard (risk of fratricide) during weapon employment.
    - The program is working on correcting the sensor vibration issue by collecting flight test data that can be used by the subsystem contractor to develop mechanical and software updates to reduce the effect of vibration. Similar efforts are underway to characterize and correct electrical interference with the controllers. The program has reported some progress in the laboratory environment on both issues, but definitive solutions have not yet been demonstrated on the aircraft.
  - The program has accomplished 36 test flights out of approximately 130 flights planned for a total of 97 flight hours (including flights added after the stall incident). Initial DT&E is now expected to be completed in May 2015.
- Delays in developmental testing have delayed the planned operational assessment by the 18th Flight Test Squadron by approximately four months. This diminishes the risk mitigation value of the operational assessment to both IOT&E and the Milestone C decision. IOT&E has been delayed until October 2015.
- Aircraft #2 is planned to undergo a second phase of DT&E prior to IOT&E in order to verify functionality of several design changes relative to aircraft #1, ranging from minor adjustments made to software and hardware integration learned from the first integration effort to more significant changes like the selection of a new intercommunication system. Since the second aircraft will not be ready until June 2015, this leaves minimal time for correction of any new deficiencies prior to IOT&E and very little time for the IOT&E crew to train on the test aircraft. This has been partially mitigated by providing both aircraft #1 and #2 to support training for IOT&E crews.
- The changes in aircraft configuration and crew complement between aircraft #2 (the test article for IOT&E) and aircraft #3 (the intended configuration for fielding) decrease the production-representative character of the IOT&E test article, diminish the utility of any crew workload studies in IOT&E, and increase the scope of the necessary FOT&E.
  - If IOT&E cannot be deferred until aircraft #3 is available, it may be made more operationally relevant by employing an eight-person crew that accounts for the movement of a combat systems operator to the flight deck and the addition of a special mission aviator (SMA) to the MOP; the ninth crewmember (the second added SMA) would not be needed without the 105 mm gun. This would allow IOT&E to more accurately evaluate tactics and workloads on the flight deck and at the MOP, and it would reduce the scope of FOT&E to focus on the addition of the 105 mm gun and final SMA.
- Draft survivability analysis plans are comprehensive, informed by legacy aircraft survivability data, and consider a range of engagement scenarios. Most of these analyses will be used to assess aspects of the AC-130J survivability using its current increment of capabilities but some are also applicable to future increment of capabilities (e.g. the Commando II Radio Frequency Countermeasures system), which is expected to be fielded in FY19.

Recommendations

- Status of Previous Recommendations. The program has addressed three of the four FY13 recommendations, and has made progress on the remaining recommendation to collect and provide DOT&E with all reliability data on the AC-130W that can augment the suitability evaluation for AC-130J. The Program Office provided some data to DOT&E, but the data are not complete. The Program Office will provide additional data to DOT&E in time for comparison to AC-130J IOT&E data.
- FY14 Recommendations. The Program Office should:
  1. Schedule sufficient time for IOT&E crew training prior to the start of IOT&E.
  2. Consider entering IOT&E with an eight-person crew to more accurately evaluate tactics and workloads.