

## AC-130J Ghostriider

### 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. An earlier version of the PSP was previously developed and tested on several AC-130W aircraft since 2009 and fielded in 2010.
- An in-flight Class A mishap in April 2015, which was caused by a second departure from controlled flight, grounded the only available aircraft and truncated the already-delayed developmental test and evaluation (DT&E) and concurrent operational assessment (OA).
- Aircraft #2 was delivered in the Block 10 configuration in June 2015.
- DT&E and the OA ended in July 2015 on aircraft #2 without completing either test plan due to both delays caused by the departures from controlled flight and limitations on weapon employment (PSP integration problems).
- Because of significant technical problems discovered during DT&E, the OA indicated the Block 10 AC-130J was at risk of not being ready for IOT&E. Per DOT&E's recommendation, the program will instead conduct IOT&E in 3QFY17 on Block 20 aircraft, which are a more operationally representative configuration of the aircraft desired for Initial Operational Capability.
- The program will conduct an Operational Utility Evaluation (OUE) on the Block 10 aircraft to support an early fielding decision and a Low-Rate Initial Production decision at Milestone C in 3QFY16.

### 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 the AC-130J by integrating a modular PSP onto existing MC-130J aircraft, and replacing the MC-130J refueling pods with weapon racks. USSOCOM continues to develop new PSP capabilities on legacy AC-130W aircraft in parallel before they are introduced on the AC-130J in an evolutionary acquisition approach:
  - The Block 10 AC-130J PSP provides a weapons suite that includes an internal, pallet mounted 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 two electro optical/ infrared sensor/laser designator pods and multiple video, data, and communication links.
  - A dual-console Mission Operator Pallet (MOP) in the cargo bay controls all PSP subsystems with remote displays and control panels (including master arm and



consent switches and a gun trigger) on the flight deck. An interim, limited-functionality, carry-on flight deck workstation for a Fire Control Officer (FCO) has been added to the Block 10 AC-130J.

- Block 20 AC-130J will add, at a minimum, a 105 mm gun, a pilot helmet-mounted tactical display, and Large Aircraft Infrared Countermeasures. The aircrew will increase from seven to nine. The first Block 20 configuration is expected to be delivered on aircraft #4 in 4QFY16.
- Future updates in Blocks 30, 40, and 50 are expected to include a permanent Fire Control Officer station, additional radar to provide all-weather engagement capability, wing-mounted HELLFIRE missiles, laser-guided Small Diameter Bombs, and radio-frequency countermeasures.
- The Block 10 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, the AN/AAR-47(V)2 missile warning system, and the AN/ALE 47 countermeasure dispensing system.
  - Vulnerability reduction features include fuel system protection (fuel tank foam to protect from ullage explosion), redundant flight-critical components, and armor to protect the crew and the oxygen supply.
- 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 for the missions of close air support and air interdiction
- Provide battlespace wide area surveillance, target geo-location, and precision munition application

## Major Contractor

Lockheed Martin – Bethesda, Maryland

### Activity

- The 18th Flight Test Squadron conducted an OA of the Block 10 AC-130J from October 2014 to July 2015. Testing consisted of 12 sorties and 47 flight hours during the DT&E period.
  - Aircraft #1 experienced a Class A mishap in April 2015 during supplemental flying and handling qualities testing and has been grounded since the incident.
  - Lockheed Martin delivered the second Block 10 AC-130J to USSOCOM in June 2015. Aircraft #2 became the test article for the remainder of DT&E and one final OA flight.
  - The program concluded Block 10 DT&E in July 2015 after completing 97 flights comprising of 307 hours.
  - Aircraft #3 began modification in August 2015 and is expected to be complete in the Block 10 configuration in March 2016.
  - Aircraft #4 began modification in September 2015 and is expected to be complete in the Block 20 configuration by October 2016.
  - Air Force Special Operations Command stood up Detachment 2 of the 1st Special Operations Group at Hurlburt Field, Florida, as the first unit to receive the AC-130J. Two crews from Detachment 2 began training on the AC-130J in August 2015 to support operational testing by December 2015.
  - The Program Office submitted an updated Test and Evaluation Master Plan to DOT&E to support a Milestone C decision in 4QFY15 and IOT&E on Block 10 starting in 1QFY16. At DOT&E's recommendation, however, an OUE will be conducted on Block 10 instead of an IOT&E to support a USSOCOM early fielding decision for the Block 10 aircraft and a Low-Rate Initial Production decision at Milestone C.
  - The 18th Flight Test Squadron will conduct IOT&E on a Block 20 aircraft in 3QFY17. Milestone C has been delayed to at least 3QFY16 in order to consider results from the Block 10 OUE and ongoing deficiency resolution efforts.
  - The 780th Test Squadron is working with DOT&E to develop a weapons lethality test plan for the Griffin missile and 30 mm gun against representative targets to support the AC-130J lethality evaluation.
  - The U.S. Air Force Combat Effectiveness and Vulnerability Analysis Branch is executing the Ballistic Vulnerability Analysis, Anti-Aircraft Artillery Susceptibility Analysis, Proximity Burst Analysis, and Occupant Casualty Analysis, in accordance with the DOT&E-approved LFT&E strategy, to support the AC-130J survivability evaluation.
- vibration environment on the picture clarity. Although testing of the newly mounted sensors has been qualitative and limited, preliminary results suggest the sensors can meet system threshold requirements.
- The sensor operator stick controllers on the MOP that control the electro-optical/infrared sensors have been modified to harden them against radio frequency interference that could cause un-commanded sensor movements. Again, preliminary results from limited testing suggest this source of sensor movement may have been corrected.
- DT&E identified additional problems with the first AC-130J PSP integration:
    - Other instances of un-commanded sensor movement occurred that were not attributable to radio frequency interference problems. Investigation identified software mode switching, operator error, and rapid aircraft maneuvers, which exceeded the sensor's servo rotation rates as causes. The program has recommended crew workarounds to avoid the problem while it investigates corrective software updates.
    - The computers in the MOP were unable to keep up with the maximum computational demands placed on them. Operators frequently reported components of the mission management software locking up and requiring a reset, and in some cases, the hardware itself shuts down for thermal protection. Correcting this problem requires a modification of the MOP hardware and software. In the meantime, operators have been advised to operate the MOP in a degraded configuration with limited capabilities in order to reduce the likelihood of a shutdown, although this workaround does not guarantee system stability. The program has made an initial modification to the hardware and continues to collect MOP performance data during the crew training period.
    - Four other software issues generated Category 1 deficiencies that may not be corrected until the software update expected on the Block 20 aircraft. At least two of the deficiencies could hinder timely and accurate targeting of weapons because of data latency.
    - Operators experienced night vision compatibility problems on both the flight deck and the cargo compartment. A correction to the flight deck problem has been implemented and will be tested in the OUE and IOT&E.

### Assessment

- The program took steps to address system integration problems discussed in last year's annual report:
  - The mounts for the electro-optical/infrared sensor balls have been modified to reduce the effect of the C-130J

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mishap. Aircraft #1 return to flight status is unknown. Preliminary results from the F&HQ testing suggest there are no significant differences in basic C-130J F&HQ caused by the AC-130J modifications.

- PSP integration problems, along with the addition of high-priority F&HQ testing after the first departure from controlled flight in February 2014, extended the DT&E schedule into July 2015, delayed end-to-end testing of weapons employment to the end of DT&E, and refocused the program's efforts on a minimum essential set of subsystem demonstrations. As a result, the grounding of the only aircraft after the Class A mishap effectively ended the incomplete OA, and DT&E concluded prematurely soon after that without completing the full intended characterization of system capabilities. This left the planned IOT&E at risk of demonstrating several capabilities for the first time and discovering problems that are more appropriately addressed during DT&E.
- The OA conducted on the Block 10 AC-130J to support the Milestone C decision and ultimately entrance into IOT&E in 1QFY16, indicated the system lacked maturity and is at risk to not be ready for IOT&E. Survivability was largely unevaluated due to flight restrictions in place and deferred subsystem integration testing in DT&E. Furthermore, the acquisition strategy to procure at most three Block 10 aircraft, then focus on the Block 20 aircraft for Initial Operational Capability (with significant capability enhancements and deficiency corrections) indicates the Block 20 configuration is the operationally representative configuration for IOT&E.
- The program recently removed full operational capability of HELLFIRE missiles from the Block 20 requirement.
- A limited amount of live fire testing against representative targets is required to evaluate the lethality of the AC-130J munitions and confirm the predictions of existing lethality models. These tests are not expected to increase the number of live shots already planned for operational testing.
- Preliminary assessment of the AC-130J survivability against operationally realistic threats will begin in FY16 after the completion of the survivability and occupant casualty analyses. These analyses are currently informed by legacy aircraft survivability data. DOT&E will supplement them with additional AC-130J susceptibility data, after the completion of relevant developmental and operational tests.

## Recommendations

- Status of Previous Recommendations. The program satisfied both FY14 recommendations regarding preparation for IOT&E, which has now been converted to an OUE on the Block 10 aircraft. However, the Program Office still needs to provide data to DOT&E on AC-130W reliability, which could inform the AC-130J evaluation.
- FY15 Recommendations. The Program Office should:
  1. Commit to the full accomplishment of lethality testing by the end of IOT&E and work with the 18th Flight Test Squadron to make resources available for such testing concurrent with operational test missions.
  2. Develop a clear and stable baseline for block capability development, test, and fielding, and brief this strategy to DOT&E.

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