KC-130J Aircraft

Executive Summary

- During FY10, the Marine Corps continued the development and fielding of Harvest HAWK, an armed variant of the KC-130J. This effort started in FY08 under an urgent universal need statement requesting rapid development and deployment of persistent direct fire and Intelligence, Surveillance, and Reconnaissance (ISR) in support of ground troops.
- Testing over the 48-week period indicates the Harvest HAWK system on the KC-130J can provide the Battlefield Commander with a limited, persistent surveillance capability with the onboard Production Target Sight Sensor (TSS). The TSS can also provide the ability to employ precision weapons using laser guidance. Because of TSS generated target coordinate and elevation errors, employment of those weapons with only GPS guidance will not be possible.

System

- The KC-130J is a medium-sized, four-engine turboprop tactical transport aircraft modified with air and ground refueling capabilities.
- The KC-130J incorporates many of the C-130J attributes, including a glass cockpit and digital avionics, advanced integrated diagnostics, defensive systems, and a cargo handling system.
- The KC-130J is outfitted with an air/ground refueling package consisting of an internally-carried 3,600-gallon fuselage tank and a hydraulically-powered/electronically-controlled air refueling pod on each wing.
- The current Marine Corps KC-130J (Block D) is flying with Operational Flight Program (OFP) software 6.5 that brings the software in line with Air Force Block 6.0 OFP.
- The Harvest HAWK system consists of a Target Sight Sensor (TSS – electro-optic/infrared targeting pod) and AGM-114P Hellfire missiles, integrated into a roll-on, roll-off Fire Control Console (FCC). An additional Standoff Precision Guided Munition (SOPGM), Griffin air-to-ground missile, uses a federated Battle Management System (BMS) for targeting and launch control.

Mission

- Combatant Commanders use the KC-130J within a theater of operations for fuel and combat delivery missions that include the following:
  - Aerial refueling of fixed wing, tilt-rotor, and rotary wing platforms equipped with refueling probes
  - Ground refueling of land-based systems such as trucks and storage tanks
  - Airdrop of paratroopers and cargo (palletized, containerized, bulk, and heavy equipment)
  - Airland delivery of passengers, troops, and cargo
  - Emergency aeromedical evacuations
- Combat Delivery units operate in all weather conditions, use night-vision lighting systems, and may be required to operate globally in civil-controlled airspace.

Major Contractor

Lockheed Martin – Marietta, Georgia

Activity

- In FY10, the Marine Corps continued the development, test, and evaluation of Harvest HAWK, the armed variant of the KC-130J. This effort started in FY08 under an urgent universal need statement requesting rapid development and deployment of persistent direct fire and ISR in support of ground troops.
- The Marine Corps provided one KC-130J for the Harvest HAWK system installation and integration, test and evaluation, and eventual deployment to theater in support of combat operations. Fleet aircrew participated to the maximum extent possible during all phases of ground and airborne operations.
- The Navy conducted developmental test and evaluation, consisting of limited scope characterization of the Harvest HAWK ISR capability, terminal laser designation capability, and safety of flight certification for use of both the Hellfire and Griffin precision air-to-ground missile systems.

- One Hellfire live missile shot experienced a warhead early burst event, resulting in minor aircraft damage. The investigation determined that the missile had an internal failure at the moment the fuze was armed by the Electronic Safe Arm Fuze timer and was not related to integration or installation on the KC-130J.
- Commander Operational Test Force conducted test and evaluation in accordance with a DOT&E-approved Quick Reaction Assessment test plan designed to evaluate the Harvest HAWK for the persistent ISR mission. Tactics, Techniques, and Procedures were also developed for fleet use.
- During operational testing and fleet training events, the Navy and Marine Corps fired 11 Hellfire AGM-114P and 7 Griffin missiles against representative targets on both instrumented and non-instrumented ranges.
- The roll-on, roll-off rapid reconfiguration of the aircraft was not demonstrated during test and evaluation.
- During FY10, Live Fire Hellfire ballistic tests consisted of two test series. The first fired threat munitions into rocket motor sections mounted on test stands. The second fired a threat into a Hellfire missile mounted on an under-wing pylon.
- LFT&E for Harvest HAWK continues in FY11.

Assessment

- Testing over the 48-week period indicates the Harvest HAWK system on the KC-130J can provide the Battlefield Commander with a limited, persistent surveillance capability with the onboard Production TSS. The TSS can also provide the ability to employ precision weapons using laser guidance. Because of TSS-generated target coordinates and elevation errors, employment of those weapons with only GPS guidance will not be possible. The location of the TSS laser mask (boundary of the airframe limits in regard to TSS azimuth and elevation limits) relative to the TSS line-of-sight was not integrated into the graphical user interface, resulting in the unplanned laser aim point break lock, terminating laser guidance for the weapon when the laser mask was encountered.
- Target coordinates and elevation generated by passive ranging (forward looking infrared only) were consistently inaccurate. The system was capable of generating non-weapons quality coordinates in completely flat terrain near sea level, but was unable to generate usable coordinates in terrain with appreciable elevation differences or mountainous terrain. Target elevation, a key component for weapons coordinate computation, was always incorrect.
- The Fire Control Operator must manually enter the target coordinates with elevation data acquired on the TSS FCC into the federated BMS laptop computer to engage targets with the Griffin missile system. Even if the coordinates had been accurate, the manual target data entry process caused data entry errors that could result in the Griffin attacking the wrong target during GPS mode of terminal guidance.
- For the Hellfire early burst event, the Navy determined that the speed of the aircraft at weapon release coupled with the short fuze arm time will result in the KC-130J entering the Hellfire safe escape fragmentation pattern every time the Hellfire fuze arms. The Navy accepted the risk associated with this hazard.
- Based on LFT&E, Harvest HAWK vulnerability to Hellfire ballistic impact is considered low. Testers placed two Hellfire missiles, one above the other, on an under wing pylon, then subjected the lower missile's rocket motor to a ballistic threat. Upon impact, the rocket motor exploded, releasing the missile's warhead section. Several minor fragment impacts occurred, but no significant damage occurred to the pylon or wing. The detonation did not affect the adjacent Hellfire missile.
- Reliability, maintainability, availability, logistics supportability, and documentation could not be fully assessed during this short test and evaluation period. However, publications, training instructions, and maintenance manuals were provided by the contractor.
- While this system is not intended to interfere with the KC-130J primary aerial refueling or secondary assault support missions, the TSS replaces the left aerial refueling pod, and the Hellfire missile launcher rail system replaces the left external fuel tank, leaving the KC-130J Harvest HAWK with half of the aerial refueling capability of the KC-130J.

Recommendations

- Status of Previous Recommendations. The Navy did not satisfactorily complete LFT&E with the Harvest HAWK capability, as recommended in FY09.
- FY10 Recommendations. The Navy should:
  1. Improve the target coordinate and elevation generation capability to provide sufficient accuracy for GPS-guided munitions.
  2. Integrate the laser mask presentation in the Graphical User Interface for the accurate display of the laser sensor azimuth and elevation location.
  3. Integrate the Griffin SOPGM into the Fire Control Console to increase system capability and improve operator efficiency and prevent operator data entry errors.