

H-1 Upgrades – U.S. Marine Corps Upgrade to AH-1Z Attack Helicopter and UH-1Y Utility Helicopter

Executive Summary

- The Navy conducted OT-IIIC FOT&E, from March through May 2015, focused on the evaluation of the aircraft System Configuration Set (SCS) 7.1 software, which is designed to enhance capabilities and correct previously identified deficiencies.
- The H-1 Upgrade aircraft with SCS 7.1 remains operationally effective and survivable. Pilots provided positive feedback on all enhancements except for the accuracy of geographic coordinates provided by the Brite Star Block II sensor on the UH-1Y.
- The new SCS 7.1 virtual targeting reticle reduces pilot workload for employment of the Advanced Precision Kill Weapon System (APKWS). Expansion of the reticle's indicating envelope is needed.
- APKWS performance was consistent with requirements. Improvements are needed in documentation and markings as well as enhancements in training to avoid inadvertently activating a special mode during preflight preparations.
- H-1 Upgrade aircraft are not suitable due to unsatisfactory measures of availability based on Full Mission Capable (FMC) and Mission Capable (MC) rates. OT-IIIC aircraft demonstrated a 63 percent MC rate because of long downtimes awaiting repair parts.

System

- This program upgrades two Marine Corps H-1 aircraft:
 - The AH-1W Attack Helicopter is upgraded to the AH-1Z
 - The UH-1N Utility Helicopter is upgraded to the UH-1Y
- The aircraft have identical twin engines, drive trains, four bladed rotors, tail sections, digital cockpits, and helmet mounted sight displays. By parts count, the aircraft are 84 percent common.
- The UH-1Y has twice the payload and range of legacy UH-1N aircraft and can deliver eight combat-ready Marines 118 nautical miles and return without refueling.
- The AH-1Z has improved payload and a high-fidelity targeting sensor for delivery of air to ground and air-to-air missiles, rockets, and guns.
- SCS 7.1 provides a virtual targeting reticle for employment of the APKWS from both aircraft. APKWS provides a



UH-1Y (near) and AH-1Z (far)

- laser-guidance section for more precise employment of the 2.75-inch rocket.
- As of October 2015, Bell Helicopter has delivered 123 of the planned 160 UH-1Y aircraft and 42 of the planned 189 AH-1Z aircraft.

Mission

Marine light/attack helicopter squadron detachments are typically deployed with a mix of UH-1Y and AH-1Z helicopters. During these missions:

- Detachments equipped with the AH-1Z use the attack helicopter to conduct rotary-wing close air support, anti-armor, armed escort, armed and visual reconnaissance, and fire support coordination missions.
- Detachments equipped with the UH-1Y use the utility helicopter to conduct command, control, assault support, escort, air reconnaissance, and aeromedical evacuation missions.

Major Contractor

Bell Helicopter – Amarillo, Texas

Activity

- The Navy conducted OT-IIIC FOT&E of the AH-1Z and UH-1Y aircraft from March through May 2015 at Marine Corps Air Station, Yuma, Arizona; Naval Air

Station, Fallon, Nevada; Marine Corps Base Twenty-nine Palms, Camp Pendleton; and Naval Aviation Weapons Station China Lake, California.

FY15 NAVY PROGRAMS

- The Navy conducted testing in accordance with the DOT&E-approved test plan dated March 15, 2015.
- OT-IIIC focused on the evaluation of the newly installed SCS 7.1 software, which improves the management and presentation of mission and geographic data to pilots, and corrects previously identified deficiencies.
- Four aircraft (two AH-1Zs, and two UH-1Ys) completed a total of 205 flight hours in integrated and operational testing. Crews completed 18 operational missions during operational testing in realistic desert environments against simulated threat targets.

Assessment

- H-1 Upgrade units with SCS 7.1-equipped aircraft remain operationally effective. The test unit successfully completed 18 of 18 planned tactical missions. Pilots provided positive feedback on all SCS 7.1 enhancements over SCS 6.0 software.
- Geographic coordinates provided by the Brite Star Block II sensor on the UH-1Y were useful to assist with basic aircraft navigation and pilot situational awareness. While not a requirement, Brite Star Sensor Block II coordinates were not accurate enough for weapons employment.
- The virtual targeting reticle reduces pilot workload for APKWS employment while the aircraft is within the parameters for APKWS launch. Expansion of the reticle's indicating range is needed beyond the current APKWS launch envelope because whenever the aircraft is outside that envelope in any parameter, the reticle parks on the aircraft datum line and stays there. Pilots complained the parked reticle provides no information on how to get back within the launch window, which can hinder the ability to fire the APKWS accurately in that situation.
- APKWS performance on both UH-1Y and AH-1Z was consistent with requirements. Improvements are needed in maintenance crew training and documentation on the mechanisms for making preflight mode selections on the rockets (which cannot be changed after take-off). Six APKWS shots missed when crewmen unintentionally enabled the counter-countermeasure mode.
- OT-IIIC aircraft met reliability and maintainability requirements.
 - UH-1Y demonstrated reliability of 5.0 mean flight hours between failures against a requirement of being greater than or equal to 0.9 hours and demonstrated 3.5 unscheduled maintenance man hours per flight hour against a requirement of being less than or equal to 3.9 hours.
 - AH-1Z demonstrated reliability of 2.5 mean flight hours between failures against a requirement of being greater

or equal to 0.8 hours and demonstrated maintainability of 4.3 unscheduled maintenance man hours per flight hour against a requirement of being less than or equal to 4.3 hours.

- OT-IIIC and fleet aircraft showed unsatisfactory results for measures of availability based on FMC and MC rates, resulting from unsatisfactory logistics supportability. H-1 Upgrade aircraft did not meet the availability requirement of being 85 percent MC. The OT-IIIC unit demonstrated 63 percent MC because of long downtimes awaiting repair parts. The longest delay time for high-priority parts delivery during OT IIIC was 61.82 days. One sixth of all high-priority components ordered had a logistic delay time in excess of 10 days. Nineteen critical components that failed were cannibalized from other aircraft and/or units in order to facilitate operational test. All of these components were related to the fielded aircraft and were not attributable to SCS 7.1 enhancements.

Recommendations

- Status of Previous Recommendations. The Navy has made progress addressing the previous FY13 recommendation to improve self-sealing capabilities of fuel bladders but still needs to:
 1. Initiate the redesign of main transmission, other gearboxes, and rotor actuators to reduce survivability deficiencies previously identified during LFT&E.
 2. Address H-1 ballistic survivability concerns in the future when aircraft components are redesigned or replaced. Place particular emphasis on improving the run-dry capabilities of the main rotor transmission and combining gearbox housings following loss of lubricant.
- FY15 Recommendations. The Navy should:
 1. Limit the use of Brite Star II-derived geographic coordinates for precision targeting until corrections are identified, implemented, and tested.
 2. Expand the virtual targeting reticle's indicating range beyond the APKWS launch envelope and provide an indication when the aircraft is out of the APKWS launch envelope. Continue/complete development of the virtual targeting reticle implementation and address pilot complaints.
 3. Continue efforts to increase the availability of spare parts, especially rotor system components, to improve aircraft availability.