UH-60V BLACK HAWK

Executive Summary
- The UH-60V BLACK HAWK cockpit increases pilot awareness of aircraft status similar to the UH-60M cockpit and adds enhanced navigational functionality compared to the UH-60L.
- Additional work is ongoing to complete software development, improve reliability, develop a performance planning module for UH-60V engines, and improve the cybersecurity posture before IOT&E in 2019.

System
- The UH-60V BLACK HAWK is designed to modernize the existing UH-60L analog architecture to a digital infrastructure enabling a pilot-vehicle interface (PVI) similar to the UH-60M. Cockpit similarity with the UH-60M enables a single Army BLACK HAWK pilot training program. Once qualified on the UH-60M, pilots can transition to the UH-60V with minimal additional instruction.
- The program goal is to achieve UH-60M commonality at lower cost than production of a new UH-60M, reduce avionics obsolescence, and upgrade navigation functionality that meets Global Air Traffic Management (GATM) requirements. By meeting GATM standards, the UH-60V can file instrument flight plans and deploy anywhere GATM standards are enforced. GATM is in use in Europe.
- The basic mission configuration includes a crew of four (pilot, copilot, crew chief, and gunner), integral (internal) mission fuel, avionics, aircraft survivability equipment, armor protection, two M240 machine guns and ammunition, and other mission-related equipment.

Mission
The unit equipped with the UH-60V BLACK HAWK will employ the aircraft to conduct movement and maneuver, sustainment, and mission command flight operations.

Major Contractors
- The Corpus Christi Army Depot at Corpus Christi, Texas, will induct and refurbish existing UH-60L aircraft before applying the engineering changes that convert the UH-60L into the UH-60V configuration.
- Redstone Defense Systems at Huntsville, Alabama, conducts design and integration of the UH-60V. They are the prime contractor under the Prototype Integration Facility, at the U.S. Army Aviation and Missile Research Development and Engineering Center.
- Northrop Grumman in Woodland Hills, California, is leading the development and integration of flight control software.

Activity
- The Army conducted airworthiness and flight characteristics testing at Redstone Arsenal, Alabama, throughout 2018. As of September 2018, developmental testing included 256 productive flight hours and 240 ground test hours in day, night, and visual meteorological conditions on engineering release software versions up to and including 4.11. The program has continued software testing in a Systems Integration Laboratory (SIL) and flight testing of software version 4.12.
- The Army conducted a 45-hour Limited User Test (LUT) in July 2018 with operational pilots and aircrews from the 82nd Airborne Division, experimental test pilots, and two Engineering Design Model UH-60V aircraft. Aircrews completed six air assault, air movement, and external load missions, during day, night, and night vision goggle flight modes, in hot and humid conditions, in the vicinity of Redstone Arsenal. Aircrews flew the aircraft in contour and nap-of-the-earth mission profiles over Redstone Arsenal and local terrain. The Army simulated threat missile launches during some of the missions.
- The Army conducted a cybersecurity Cooperative Vulnerability and Penetration Assessment (CVPA) in February 2018 using one UH-60V aircraft in a hangar and the

UH-60V SIL to identify potential cyber-attack vectors. In July 2018, the Army conducted an Adversarial Assessment (AA), using an aircraft with aircrew in a hangar and the UH-60V SIL to identify and exploit cybersecurity vulnerabilities.
- The Army Survivability and Lethality Analysis Directorate completed a vulnerability analysis in September 2018 against expected, kinetic threats.
- The Army conducted all testing in accordance with a DOT&E-approved Test and Evaluation Master Plan and test plan.

Assessment
- The Army identified 12 deficiencies and 43 shortcomings at the completion of software version 4.9 testing in May 2018. Many of these shortcomings were observed during the LUT and have since been corrected and verified in flight testing.
- Aircrews successfully completed all six attempted single- and dual-ship missions during the LUT. Pilots made positive comments about increased awareness of aircraft status and enhanced navigation capabilities of the UH-60V compared to the UH-60L.
- The UH-60V is equipped with the General Electric 701D engine, which is capable of meeting UH-60V performance requirements. The UH-60V is limited at Milestone C to 701C engine power. The UH-60V does not have an Air Worthiness Release (AWR) allowing the full power of the 701D engines to be realized. Once the program attains the AWR, the UH-60V will meet the performance requirements for external lift and air assault range. In addition, the UH-60V will be equivalent to the UH-60L in the performance requirements for endurance and self-deployment. The software development of the performance planning software, which enables the attainment of the AWR for the UH-60V with 701D engines, has begun and the Program Office expects to demonstrate 701D power in IOT&E in 2019.
- The UH-60V aircraft was below planned reliability growth goals during the LUT. The LUT aircraft were configured with version 4.9 software that had a number of known reliability failure modes that have been corrected and verified as fixed in software version 4.11.
- The CVPA identified a number of potential insider and near-sider cyber-attack vectors. The AA confirmed that some of those vectors could be exploited and, to a limited extent, explored the likely mission effects of successful exploitation
- The vulnerability analysis found that there is no appreciable difference between the UH-60V and the legacy UH-60L in force protection, aircraft attrition, and forced landing kills when engaged by armor-piercing incendiary threats, high explosive incendiary threats, and rocket-propelled grenades.

Recommendations

The Army should:
1. Continue to develop UH-60V software to address the frequent reliability failure modes.
2. Develop performance planning software for the UH-60V with 701D engines.
3. Eliminate or reduce the cybersecurity vulnerabilities.
4. Conduct all post-Milestone C developmental flight testing with mission equipment (radios, aircraft survivability equipment, and crypto gear) installed and operational.