

Combat Rescue Helicopter (CRH)

Executive Summary

- The HH-60W Combat Rescue Helicopter (CRH) is currently in the Engineering and Manufacturing Development (EMD) phase, with first flight of an EMD aircraft completed in May 2019.
- Qualification testing of many components of the aircraft has uncovered technical deficiencies. As a result, the program began flight test with a large number of CRH-specific systems in non-operationally representative configurations.
- The Air Force held a Milestone C decision review on September 24, 2019.

System

- The HH-60W CRH is a new-build, dual-piloted, multi-engine rotary-wing aircraft based on the UH-60M.
- The aircraft is designed to fly a combat radius of at least 195 nautical miles without aerial refueling and conduct an out-of-ground effect hover at its mid-mission gross weight.
- The HH-60W survivability enhancement features are intended to be equivalent to or better than the current HH-60G aircraft:
 - Crew and cabin armor, self-sealing fuel cells that do not suffer catastrophic damage from high-explosive incendiary rounds, and crew and passenger crashworthy seating
 - Two external mount gun systems with forward and side-firing crew-served weapons including the GAU 2B, GAU-18, and GAU-21
 - Aircraft survivability equipment including the AN/AAR-57(V)3 common missile warning system, the AN/ALE-47 countermeasures dispenser set, the AN/AVR-2B(V)1 laser detecting system, and the AN/APR-52(V)1 radar warning receiver (RWR)
 - An upturned exhaust system to reduce its infrared (IR) signature



Mission

- Commanders will employ units equipped with the HH-60W to:
 - Recover isolated personnel from hostile or denied territory, day or night, in adverse weather, and in a variety of threat environments from terrorist attacks to chemical, biological, radiological, and nuclear threats.
 - Conduct humanitarian missions, civil search and rescue, disaster relief, medical evacuation, and non-combatant evacuation operations.

Major Contractor

Sikorsky Aircraft Corporation – Stratford, Connecticut

Activity

- The Air Force began integrated contractor-government developmental test (DT) with four EMD aircraft and one System Demonstration Test Article aircraft at West Palm Beach, Florida, and Stratford, Connecticut.
- The 47th Cyber Test Squadron and the Program Office conducted three phases of Cyber Vulnerability Investigation in the CRH Systems Integration Laboratory.
- The Air Force held a Milestone C decision review in September 2019 to begin low-rate initial production.
- The CRH Program Office prepared a Test and Evaluation Master Plan (TEMP) update to support Milestone C, but the Air Force has not yet submitted it to DOT&E for approval.
- In November 2018, the Program Office completed the qualification testing and limited live fire testing of a full-size

fuel cell to evaluate the fuel cell vulnerability to expected small arm and high explosive incendiary threats.

- In November 2018, the Program Office completed the live fire testing of the legacy aerial refueling system to determine the likelihood of initiation of an onboard fire. In April 2019, the Program Office performed fire sustainment testing in aircraft-representative dry bays to evaluate the time to flight-critical failures.
- In July 2019, after completing a set of qualification testing for the cabin and cockpit armor, the Program Office started the live fire testing of armor coupons to evaluate the effectiveness of the armor against expected threats.
- The program has conducted LFT&E in accordance with the DOT&E-approved Alternate LFT&E Strategy.

Assessment

- DT generated satisfactory performance data to support the Milestone C decision. The HH-60W demonstrated the ability to meet hover, range, airspeed, payload, and fuel consumption requirements. There is little margin in maximum gross weight to accommodate any weight growth caused by design or equipment changes. Furthermore, the DT has been on non-operationally representative aircraft, with planned updates to include aircraft software, aircrew seating, and armor.
- The Air Force Operational Test and Evaluation Center identified several deficiencies:
 - Poorly designed hover symbology does not provide necessary safety-of-flight cues in degraded visual environments.
 - The mission planning system will not be available in an operationally representative configuration at the start of IOT&E. Although aircrews will be able to generate mission data through workarounds or alternative tools, the extent of modifications to both the mission planning system and aircraft system software may limit the evaluation. The Program Office is working to provide more complete mission planning capabilities during IOT&E.
- Reliability and availability during early developmental testing have supported the required sortie generation rate. However, preliminary reliability data are not consistent with the reliability growth strategy in the approved TEMP. The Program Office has evaluated the Milestone C data against a contractual specification to meet the reliability requirement roughly 2 years after IOT&E, but the projected reliability during IOT&E may not meet the requirement.
- The developmental AN/APR-52(V)1 RWR performed comparably to similar fielded systems in subsystem-level Integrated Demonstrations and Applications Laboratory testing. On-aircraft developmental testing will begin in FY20, but the Milestone C TEMP update does not include resources that may be necessary to complete RWR flight test in IOT&E should DT uncover deficiencies.
- The program has completed three phases of DT cybersecurity testing in the CRH Systems Integration Laboratory. However, early phases of test were constrained by lack of access to some subsystem software and to operationally representative maintenance and mission planning computers.
- Fuel cell qualification and live fire testing demonstrated several performance limitations:
 - The design does not meet the Military Detail for cold temperature self-sealing performance against some threats. The Program Office has modified the acceptance criteria to allow some fuel cell leakage to be considered a pass of the specification.
 - Qualification testing of the fuel cell caused substantial hydrodynamic ram damage to the test article, necessitating repairs and analysis of system impact prior to continued testing.
 - The high explosive incendiary live fire shots caused significant damage to the surrounding aircraft structure. The Army's 29th Combat Aviation Brigade repaired this damage using representative battle damage repair techniques, which will inform future repair procedures for HH-60W.
- Redesigned cabin and cockpit armor passed qualification testing, with armor coupons demonstrating the ability to defeat the spec threat.
- The self-sealing fuel hoses of the aerial refueling system demonstrated some capability against ballistic impact although full severance caused more fire initiations than expected. In FY20, the Program Office will complete a third phase of testing to quantify risk to the aircraft from such fires using fully flight-representative hardware.

Recommendations

The Air Force should:

1. Correct the hover symbology to support safety-of-flight in degraded visual environments.
2. Ensure that sufficient mission planning capability is available in IOT&E to support operationally representative mission planning and execution.
3. Continue to support cybersecurity testing by providing test teams with access to all components, software, and support equipment.