

## HH-60W advances

*Aerospace testing international*

**Before the first engineering manufacturing and development Sikorsky HH-60W helicopter takes to the air in 2018, infrastructure and test facility developments on the ground are being completed**



Sikorsky reached a milestone in the development of the next combat rescue helicopter (CRH) for the US Air Force in early February, with the award of a US\$203.4m contract to build five system demonstration test articles (SDTA). The five helicopters will be completed to production standard and are in addition to the four engineering manufacturing

and development (EMD) aircraft already under development under a US\$1.2bn contract. The first of these EMD helicopters is due to fly for the first time in 2018.

Ahead of flight testing, Sikorsky has also recently commissioned a 2,500ft<sup>2</sup> (762m<sup>2</sup>) systems integration laboratory (SIL) at its primary manufacturing facility in Stratford, Connecticut, to test key avionics and missions systems for the new helicopter.

The SIL was formally opened in December 2016 and has already begun test and development work for the CRH, which is designated the HH-60W. The USAF has a requirement for 112 HH-60Ws to replace its aging HH-60G Pave Hawk fleet.

### **Combat Rescue**

Sikorsky is using the tried and tested UH-60M Black Hawk battlefield utility helicopter currently in production for the US Army as the baseline for its HH-60W development, but the new helicopter is not merely a modification of the older design. The USAF program of record is for a total of 112 HH-60W helicopters.

Sikorsky says the HH-60W is built from the 'ground up' as a CRH, with a comprehensive avionics and mission systems suite, additional internal fuel capacity and enhanced weapons carriage capability. Gross weight is increased to 22,500 lb (10,206kg) but the HH-60W utilizes the same General Electric T700-GE-701D engines, composite rotor blades and drive train as the UH-60M. This commonality of parts will reduce lifetime costs despite differing mission requirements between the USAF and the US Army (which needs to lift a greater number of troops over shorter distances).

The HH-60W is designed for long-range combat search and rescue and special operations support missions and has almost twice the internal fuel capacity as the baseline US Army UH-

60M – 660 US gallons (2,500 liters), as opposed to 360 US gallons (1,360 liters). Sikorsky says this is sufficient to meet the USAF requirement for a 195 nautical mile (361km) combat radius.

A flexible external weapons system supports both 7.62mm and .50 caliber fixed forward and crew-served weapons. The cabin, cockpit floor and walls have improved armor protection against small arms fire.

The heart of the avionics and missions systems is the Lockheed Martin (now Sikorsky Missions Systems) Tactical Mission Kit (TMK), which integrates a number of largely off-the-shelf systems, including an AAR-57 missile and hostile-fire warning system, AVR-28 laser warning system, ALQ-210 digital radar warning receiver (DRWR), integrated chaff and flare defensive system, Link 15 tactical datalink (TDL), radar and



a forward looking infrared (FLIR) system. The exception to the off-the-shelf philosophy in the TMK is the advanced mission systems computer, which is the only item being developed from the outset.

### **Systems Integration Lab**

The major CRH program testing activity at the present time is the recently opened SIL, which includes four laboratories for testing the avionics, electrical power, electronic flight controls and integrated vehicle diagnostics systems. Sikorsky says that each system is due to be tested independently before it progresses to aircraft representative (fully integrated) testing.

“The SIL is unique only in that it is tailored directly to the requirements of the CRH program. We don’t have to add all the dynamic components, engine controls and flight controls of the air vehicle,” explains Tim Healy, director of Sikorsky’s CRH program. “We do have some work that we have to do in that regard, but predominantly our SIL is to take the UH-60M ‘backbone’ avionics and modify them to meet CRH needs. A significant amount of that testing work is supporting the integration of the Lockheed Martin TMK.”

Healy is a former USAF test pilot, with both operational and flight test experience on the HH-60G (including commanding a USAF Reserve Pave Hawk squadron in Afghanistan) and he also led the USAF’s Bell-Boeing CV-22 Osprey development test team. He has approximately 4,000 flying hours, accumulated in 41 types of helicopter, fighter and transport aircraft.

The SIL consists of two cockpit mock-up units, which allows two helicopters to be ‘flown’ simultaneously and places humans in the loop; a TMK integration bench; a software development bench; and a number of smaller software development benches that focus on the individual line-replaceable units in the HH-60W systems.

“The facility provides a simulated flight environment, allowing us to test key subsystems individually and then fully integrated. This will identify any issues before advancing to test flights and will help reduce the number of required flight test hours, resulting in time and cost savings for the customer,” Healy adds. “The SIL is testing the helicopter systems; we’re not developing new ‘development tools’. The facility became operational in phases; it is fully operational now and that was achieved just after our ribbon-cutting ceremony on December 7 last year, with the delivery of the TMK in January. But we’ve been doing development and testing in there since last summer.”



Under the CRH contract, Sikorsky is developing a second SIL that will be installed at the USAF’s sustainment facility at Warner-Robins Air Logistics Center in Georgia. This second laboratory is already in production and will be delivered in the middle of 2018.

#### **Software testing**

The Tactical Mission Kit is being developed by Sikorsky Mission Systems (Lockheed Martin prior to the recent merger of the two defence giants) and the software is initially being tested in a dedicated SIL in the company’s facility in Owego, New York.

“They then deliver it to us here in Connecticut in blocks, or software releases, and we feed it in to our SIL to continue with the integration of the overall system,” Healy continues. “The culminating milestone is in what we call our flight-worthy air release, so all the software will culminate with a single flight-worthy release software drop, which we call system configuration seven. We’ll go through several system configurations and will have an airworthy release in mid-2018.”

Testing in the SIL is overseen by USAF representatives, who visit regularly and continuously review the test results. “The USAF will also oversee the overall test program, not just the SIL, and we’re operating in an integrated test team environment where the Air Force and Sikorsky will both participate side by side,” Healy adds. “We will share all the data openly with each other, because that has been proved on many programs to be the most efficient way to do developmental testing.”

The release of the flight-worthy software is timed to support the beginning of the flight test campaign, which is also due to get underway in 2018. Following this, Sikorsky’s SIL will be used for continual development work and the testing of future software upgrades, as well as activity to support foreign military sales of the HH-60W, should customers emerge.

### **Working toward flight test**

Because the HH-60W will be operating at higher gross weights than the baseline UH-60M, consideration is being given to structural fatigue cracking from the outset – a lesson learned from the HH-60G and similar variants, which operated at weights higher than they were initially designed for.

“There is a lot of analysis that supports the planned life of the airframe, defining the usage spectrum, loads and criteria analysis, for example, and that is all underway right now,” Healy says. “We also have a full program of instrumentation and flight load survey, which will begin after the first flight in 2018.”

The additional five helicopters awarded under the February 2 SDTA contract will support the development test program and also provide initial flight training for USAF experimental test and instructor pilots. Sikorsky says these aircraft will follow on from the four EMD aircraft, with deliveries to begin in early 2019 and, once they have been delivered, they will allow the USAF to conduct initial operational test and evaluation activities.

Assembly of the four EMD helicopters will begin early this year, with delivery in 2018. The overall program is running ahead of the contracted schedule, with SDTA deliveries set to begin in 2020, following the EMD phase and some six months early.

“The program baseline is 75 months in total, from contract award to the end of the SDTA phase, a point which known as RAA – required assets available,” Healy concludes. “We are executing to a schedule that will get us to that RAA in 69 months, on March 26, 2020.”