

Dogs and Reapers Share the Deck

Gert Kromhout attended a media day on board the USS George Washington during the final developmental test phase at sea for the F-35C Lightning II



Four F-35Cs from VFA-101 overfly the USS George Washington with tail hooks lowered on their departure back to Eglin Air Force Base, Florida. Todd McQueen/Lockheed Martin

The US Navy plans to declare the Lockheed Martin F-35C Lightning II with initial operational capability (IOC) at some point between August 2018 and February 2019. From then on this new jet can be operationally deployed. However, a lot of work still has to be done before it is ready. In August, the navy made a huge step when the F-35 Integrated Test Force (ITF) based at Naval Air Station Patuxent River, Maryland, conducted the Developmental Test Phase Three, commonly referred to as DT III, on the aircraft carrier USS George Washington (CVN-73).

Validation

DT III focused on validation of the aircraft's flying capabilities with full inert internal and external stores, handling tests with asymmetrical loads, testing for maximum weight launches at minimum power and evaluating all tests in a variety of wind and sea conditions. Additionally, some night flying took place to verify the performance of the Generation III helmet.

Thomas Briggs, the Air Vehicle Engineering Department Head of the F-35 Lightning II ITF, described DT III as the culmination of five years of hard work on the F-35C: "We did the first DT in November 2014 on the USS Nimitz (CVN-67). That was focused on the flying characteristics of the jet. The second test phase [DT II] was on the USS Dwight D.

Eisenhower (CVN-69) in October 2015. In that test phase, the flight envelope was further expanded, aircraft loaded with internal weapons were launched and recovered while evaluating their flying and handling qualities under various wind conditions and catapult settings.

"In DT III, we basically do the same as in DT II but with external and asymmetrical loads. We take off and land, evaluate handling qualities and compatibility with the ship with those weapons underneath. Then we proceed to the next test points. We are also using Block 3F software, which will be the software load that has to be operational at IOC."

Bulletins

According to Briggs, the objective of DT III was to prepare the so-called aircraft launch and recovery bulletins (ALB/ARB): "The ALB/ARBs are guidelines deck personnel have to use in order to set the catapult and arresting gear, which depend on the weight of the aircraft. These bulletins ensure that we can launch and recover aircraft safely."

The ITF sent 170 personnel on board. Two test aircraft CF-03/SD73 and CF-05/SD75 arrived on the George Washington on August 14.

Over a 14-day period, five test pilots completed 500 test points as Lieutenant Commander Daniel Kitt, Carrier Suitability Lead with the F-35 ITF, explained: "Of the 500 test points, 315 are of the so-called threshold type, which means they have to be completed. The others are objective test points which we do when we have

time and assets available on the ship."

Many, if not all, of the test points undertaken on board the USS George Washington were carried out to verify what the ITF had already tested on ashore. Naval Air Systems Command has TC-7 catapult and Mk7 arresting gear systems at Patuxent River and Naval Air Engineering Station Lakehurst, New Jersey, which are identical to those on the carriers. However, some conditions cannot be simulated ashore. Examples are the absence of ground effect on the deck and the turbulence behind the ship caused by the carrier's island, a phenomenon called the burble.

Intensive Preparation

Preparations for DT III were intensive and according to Lt Cdr Ted Dyckman, a test pilot with Air Test and Evaluation Squadron 23 (VX-23) 'Salty Dogs', focused on the tests to be conducted on the carrier: "We rigorously simulated and tested in simulators, computers and on land bases. Executing the tests on the ship is often an anti-climax, because they usually go as expected."

During DT II, the squadron completed launch and recoveries with two internally carried inert 1,000lb GBU-32 Joint Direct Attack Munitions. In DT III, up to four 500lb GBU-12 laser-guided bombs and two AIM-9 Sidewinder missiles were added on external pylons. Lt Cdr Dyckman said: "We gradually increased the loads up to the maximum launch weight of 66,000lb [29,937kg]. First we load the wings symmetrically with an identical configuration under each wing, then we change the configuration under one wing. Aircraft CF-03 and CF-05 are fully instrumented for capturing and transmitting data in real time to the mission control rooms in the hangar bay where many engineers measure behaviour and the physical condition of the aircraft to ensure we do not exceed the limits. We make sure that everything goes as planned before we proceed with the next test point."

Carrier Qualifications

Before commencing DT III, the Patuxent River-based test pilots first had to qualify for deck landings, known as CQs, and did so with instructors from Strike Fighter Squadron 101 (VFA-101) 'Grim Reapers' Fleet Replacement Squadron based at Eglin Air Force Base in Florida, the unit tasked with the training new US Navy and US Marine Corps F-35C pilots.

All 12 of VFA-101's instructors have made many deck landings in other types, but for most of them landing on the flight deck of the USS George Washington was their first time they put down the F-35C

on a carrier.

For daylight qualification, two touch and goes and ten landings, dubbed traps, are required. The CQs went very well. VFA-101 had planned two full days to complete the task, but within 24 hours almost all VFA-101 and VX-23 pilots were qualified. Lt Cdr Kitt loved it: "This proves the many hours VX-23 spent making the aircraft ready for the fleet paid off."

Lieutenant Graham Cleveland, VFA-101's lead Landing Signals Officer, who was also the LSO during DT I and DT II in 2014 and 2015 respectively, expressed his relief: "It is my job to qualify the pilots and ensure that everything goes safely. You know, when the weather is this good, it cannot get any better than landing on a carrier."

Delta Flight Path

All of the VX-23 and VFA-101 pilots agreed the favourable weather and sea conditions contributed a lot to the success of them qualifying, but all added that a new landing technology played a much more important role. Known as the Delta Flight Path (DFP), the system was developed by Naval Air Systems Command in cooperation with BAE Systems in the UK. It automates the glideslope, which in the final phase before touchdown on the deck is a really precise piece of flying. Without DFP, the average pilot makes between 200 and 300 corrections with throttle, stick and rudder in the last 18 seconds before the trap. DFP reduced the number to 20 for a pilot using it for the first time.

Major Eric Northam, a US Marine aviator assigned to VX-23 who had completed 160 traps in legacy F/A-18 Hornets prior to DT III, made his first F-35C trap on the George Washington during the period at sea: "To come aboard, in particular at night, was always stressful, but with the F-35C and DFP it is a non-factor. When I landed for the first time I was surprised about how easy it was. Even if you make a significant deviation from the glide slope it is easy to get back on."

Briggs contends that what the Naval Air Systems Command, BAE Systems and the F-35 ITF have developed really works in the fleet, but that pilots have to change their mindset: "You should not approach DFP as you do with a strictly manual approach. If you work it really hard, you are not allowing it to work for you. The fleet must understand that DFP means you have to fly the aircraft very differently to get the most out of it."

Green Glow

Despite the success at qualifying by day, VFA-101 pilots were unable to qualify for night operations. Software for the Generation III helmet has not been released



F-35C Lightning II CF-05 takes off from the USS George Washington on a pilot carrier qualification flight on August 15. Todd McQueen/Lockheed Martin

to the fleet, but was being tested in DT III. Briggs explained that during DT II the helmet did not function optimally: "During DT I, test pilots discovered a green glow, as if they were looking through a dirty window. The pilots could not see the lighting of the ship and also had difficulty seeing aircraft around them. In DT II we saw an improvement, but the problem was not fully solved. In normal overland night operations it was not really an issue, but in a moonless dark night at sea it was. We expect to have this problem fully solved now."

Early Completion

Aircraft CF-03 and CF-05 returned to Patuxent River on August 26, one week earlier than planned, after completing all tests. They had flown 41 flights

accumulating 39.7 flight hours, 121 catapult launches, 70 touch and goes, one bolter and 121 traps, but their return to Patuxent River does not mean it's time to relax, as Thomas Briggs explained: "After we finish here we unload in Norfolk. Our equipment does not go to Patuxent River, but directly to San Diego for embarkation on the USS America (LHA-6) for the F-35B's DT III phase."

As for the F-35C, some catapult and arresting gear tests remain to be completed at Patuxent River for IOC in the summer of 2017. Concluding, Briggs said the F-35 ITF and VX-23 will not go back to the carrier again: "VX-23 will be involved in ongoing developmental tests because it's a continuing process as long as the F-35C is in service."



F-35C Lightning II CF-05 over the flight deck of the USS George Washington immediately before catching the wire. The aircraft is loaded with one inert GBU-12 laser-guided bomb. Michael Jackson/Lockheed Martin