

HEADQUARTERED AT NAVAL Air Warfare Station (NAWS) China Lake, California, VX-9 'Vampires' is long established as the center for operational flight-testing within the US Navy. It prides itself on providing the true litmus test of a new type or capability. The unit has been engaged in Super Hornet, Growler, Harrier and Cobra work to name but a few over recent years, putting each of these aircraft to the sword, but it now has a new focus — the F-35C.

If ever there was going to be a squadron that would look the Lightning II squarely in the face and poke holes in any shortcomings, it was going to be VX-9. The buck stops here. If a type or system isn't ready to be thrust into the most demanding of all military aviation environments — a US Navy big-deck aircraft carrier in a high sea state at night — the 'Vampires' simply aren't going to rubber-stamp it, irrespective of external pressures.

VX-9 Det Edwards, under the charge of CAPT Matt Norris, carries a heavy weight of responsibility. Among other duties, it is tasked with taking the carrier variant of the F-35 into initial operational test and evaluation in 2018.

Of the three US services that operate Lockheed Martin's stealthy fifth-generation fighter, the Navy has been the most openly critical. It's also been the least aggressive when it comes to schedules. The Marines and Air Force have already declared initial operating capability, but the Navy has insisted it cannot follow suit until it receives a full suite of warfighting capabilities, aiming instead for a window between August 2018 to February 2019.



VX-9 at Edwards

The Navy's Edwards AFB detachment has six F-35Cs and around 130 personnel. Like the US Air Force, Marine Corps, British and Dutch operational testers at this California base, VX-9 Det Edwards is a vital element of the F-35 Joint Operational Test Team (JOTT).

'We have our full complement of people and jets, including ten pilots,' explains CDR Ernest 'Big Ern' Anderson, executive officer (XO) of VX-9 Det Edwards. 'We are now in a phase of building our flying hours and experience on the F-35C for when initial operational test and evaluation [IOT&E] starts. All of our flights now are focused on training to the skill-sets we need in order to be successful in the testing.'

While a formal start date had not been agreed as of November, most agree that late spring into early summer is the most likely timeframe. This is being driven by completion of the related development test (DT) activity, which will enable the formal opeval to start.

'We report to China Lake, but we essentially operate as our own squadron down here,' Anderson continues. Commenting on VX-9's position within the JOTT, he says: 'We fly together on a weekly basis as sections or divisions with our Air Force, Marines, British and Dutch colleagues. We all have similar goals in testing the F-35, but we also have more specific areas that are service-related. It all works very well under the JOTT umbrella as we gear up for IOT&E.'

This important phase has been delayed by clearances and full availability of the latest Block 3F software in the jets. 'We have some older airplanes from the early low-rate initial production [LRIP] lots that need hardware and software modifications in order to be ready to receive Block 3F,' explains Anderson. It's a schedule that's seen VX-9 jets and those from the partner units being dispatched to air logistics centers for these modifications. Ultimately, VX-9's goal for IOT&E is to have six jets that are all in 3F configuration. A White Force is putting the final touches to the formal test plan in order to maximize the scheduled events. These will dictate the schedules for the JOTT squadrons next year as they mount specific trials and report back on them.

Maj Corey Florendo drops a GBU-31 from VX-9 F-35C CF-08 over the NAWS China Lake ranges. Lockheed Martin/Chad Bellay



Traditionally associated with US Air Force flight-testing, Edwards AFB, California is known as the home of 'the Right Stuff'. Today, that important test work continues. For the F-35 test program, it brings together a raft of operators, not least the US Navy in the shape of VX-9 'Vampires'.

REPORT **Jamie Hunter**

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WITH 'THE RIGHT STUFF'



Carrier work

Some of the specific Navy work that Anderson mentions includes aircraft carrier testing. Three periods of dedicated DT have been completed. During the first two, in November 2014 on the USS *Nimitz* and October 2015 on the USS *Dwight D. Eisenhower*, pilots conducted catapult take-offs, arrested landings, and touch-and-goes while opening up the flight envelope of the F-35C. The third period — DT-III — which began on August 14, 2016, aboard the USS *George Washington* off the coast of Virginia, included more than 600 test points including launch and recovery with external stores such as GBU-12 laser-guided bombs and AIM-9X Sidewinders. Among the areas examined were the F-35C's approach handling qualities with symmetric and asymmetric external stores, so-called Delta Flight Path testing, Joint Precision Approach and Landing System (JPALS) testing, crosswind and maximum-weight launches.

Incredibly, even though formal operational testing has yet to be started, both VFA-101 'Grim Reapers' and VFA-125 'Rough Raiders' — the Navy's two training Fleet Replacement Squadrons — have both completed periods at sea to carrier-qualify (CQ) pilots and landing signals officers (LSOs). It's all part of the forward-leaning way the Lightning II is being introduced into service.

'We CQ'd our first pilot from VX-9 last September and three more are currently working with VFA-101 and -125 to get qualified,' Anderson says. 'There are already multiple boat detachments going on in preparation for OT-1 — our first formal operational test period on the boat — next summer. For this we will embark on the carrier and execute specific test points to assess suitability for mission-readiness.'

Navy pilots must typically complete 10 daylight 'traps' and six night 'traps' aboard the carrier in order to achieve an initial qualification. Anderson says,

'Right now we're not qualifying pilots in the F-35C at night.' This is due to the fact that ongoing test work is still fine-tuning the Gen-3 pilot's helmet. Night launches and recoveries have been demonstrated successfully by the NAS Patuxent River Integrated Test Force, initially during DT-II in November 2014. 'Coming back to an airfield at night is very different to coming back to the ship,' Anderson continues. 'The night vision camera [in the helmet] is already very capable in the tactical environment, but flying around the carrier at night is a [very different] situation. So, there are some improvements being made that should allow us to move forward with night CQ soon. It really comes down to how dim you can get the symbology in the helmet. Us navy guys are notorious for dimming down every light source in the cockpit as much as possible in order to open up the aperture in our eyes for better night vision. This is so you can see the landing area and see the [Fresnel] lens.'

While there are clearly a few technical wrinkles to iron out at night, overall there is a huge success story to tell in the F-35C's Delta Flight Path. This builds upon previous advances in technology, designed to simplify the process of landing aboard the carrier. 'Delta Flight Path makes the F-35C considerably easier to land aboard the carrier,' says Anderson. 'The data we saw from VFA-101's last detachment was eye-watering in terms of how accurate they were at landing without bolters, or high or low passes.'

Navy pilots flying on to aircraft carriers with an arresting cable execute their approaches in a way that's geared towards their angle of attack (AoA). In older types, without auto-throttles,

Above left: CDR Ernest Anderson is the XO of VX-9 Det Edwards. Prior to the F-35C he flew S-3 Vikings, as well as 'classic' and Super Hornets. **Jamie Hunter**

Below: A VX-9 Det Edwards F-35C taxis out for a morning mission. The aircraft make regular use of the large R-2508 range complex to the north of Edwards AFB. **Jamie Hunter**





a pilot flew a 'three-point power correction'. This technique still applies during training in the T-45 Goshawk, and is workload-intensive and takes a lot of practice.

Anderson explains, 'I'm at my optimum AOA for landing. That's the point where the airplane is flying as slow as possible, but also it's the point where if I add power the jet will efficiently climb — it's very controllable. If I'm too high I can't just pull the power off. I must stay ahead of the power corrections for the engines because there's a spool-up time lag between moving the throttles and the RPM coming up. I want to 'chip it down'. I take a little power off, but also add a little back in, then see how that correction comes in. Take a little off, put some back in — then watch it. We beat that into guys at flight school!'

Above: A VFA-101 'Grim Reapers' F-35C prepares to launch during the carrier qualification part of DT-III.
US Navy/MCS2C
Kris R. Lindstrom

Below: F-35C CF-05 of VX-23 'traps' aboard the USS George Washington in August 2016.
US Navy/MCS2C
Kris R. Lindstrom

As fleet jets have become more advanced, some of these elements have been alleviated through the advances in auto-throttles. The Super Hornet is now flying with a system called Magic Carpet, which is essentially very similar in nature to the F-35's Delta Flight Path. Anderson says the F-35 is now 'dialed in' to the ship. It enables the pilot to input a reference for the ship — the pilot is flying, but the jet makes the small corrections.

CDR Tony Wilson, a development test pilot with VX-23, said: 'Delta Flight Path is an innovative leap in aircraft flight controls — this command enables the F-35 to capture and maintain a glideslope, greatly reducing pilot workload, increasing safety margins during carrier approaches and reducing touchdown dispersion.'

Anderson adds: 'The jet knows the ship's speed and the wind speed over the deck. The pilot still flies the line-up, but the jet is assisting you with the glideslope corrections.' Testing revealed an extraordinary reduction in the level of pilot inputs in the final approach phase to the carrier. It has huge implications for the future of carrier aviation.

'Pilots have felt confident to go to the ship in half the amount of 'looks' that it would have previously taken,' says Anderson. 'Even for first-time pilots going to the boat, it will undoubtedly reduce their time to prepare.' However, he says it's unlikely to change the way pilots are taught in the immediate future. The T-45 still needs to be flown manually, and there's always a chance that the technology will fail and the pilot will have to fly a completely manual approach.

Chances are that the Navy will always require a pilot to be able to fly a fully manual approach to the carrier. Even with the advent of new technology, pilots on their first cruise with an air wing in the Super Hornet are still required to fly all manual 'passes'. They only start to fly with auto-throttles on their second cruise, though it's down to the air wing. Ultimately, the commander is responsible for everyone's safety.

Proving the technology

The Super Hornet is loved by pretty much anyone you speak to in the Navy. It's got two engines, it's versatile, reliable, and it's got single-seat and two-seat options. The fact that the F-35 has a single engine is enough for many naval aviators to thumb their nose at it. It's going to be down to fleet usage, and clocking up hours and deployments, that will ultimately decide how the F-35C fares at sea.



“Delta Flight Path makes the F-35C considerably easier to land aboard the carrier

CDR Ernest Anderson



In the more immediate term, it's down to VX-9 to ensure the aircraft that goes to sea is operationally suitable. It's impossible to stop a piece of stray metal from going down an intake on a 'cat shot' and there's a lot at stake if an F-35C loses the motor at the boat. Anderson says it just changes decision-making when it comes to emergencies.

There's a similar thought when it comes to maintaining the low-observable coating on the jet during long cruises. Anderson considers it to be part of an important shift in mindset. He says the integrity of the low-observable technology 'changes decisions on where and how we fly the airplane.

'We had a similar progression with Super Hornet — how we keep it clean, how we maintain it on the ship. The F-35 is another generational leap. F-35 maintenance on the ship is a concern, but it's the same for any aircraft operating

near salt water. We take corrosion control very seriously in the Navy.'

Looking towards the tactical side of the mission, Anderson acknowledges that the USAF and USMC have flown the aircraft for longer and built up more experience, but he says that's just the nature of the timeline. 'We are working on fighter integration, we've completed two detachments to NAS Fallon to work with TOPGUN and NAWDC [the Naval Aviation Warfighting Development Center], and IOT&E will further support Navy tactics development. We're looking at the total spectrum — the F-35C adds a deep strike capability to the carrier air wing, but in addition the aircraft will fly SEAD [suppression of enemy air defenses], OCA [offensive counter-air] and DCA [defensive counter-air]. The current handcuffs on the F-35's operating limits have constrained the Navy's work with regard to g-limits and airspeed, which has slowed flying

specific missions such as basic fighter maneuvers. Anderson says it doesn't mean the F-35 can't do it — it just hasn't been fully tested yet. 'Right now we have two jets in Block 3F6.2 configuration. The software doesn't open up the limits — that's down to testing — but we expect the full 7.5g envelope soon.'

VX-9 Det Edwards is ideally located to push the F-35 to its limits: using the ordnance and electronic warfare ranges at China Lake, flying air-to-air over the Pacific, working with the assets at Fallon and even going up against the high-end threats of the Nevada Test and Training Range (NTTR). A busy time lies ahead, and VX-9's efforts will pave the way for the first F-35C operational deployment in 2021. 🇺🇸

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Above: The increased wing area of the F-35C is readily apparent in this view. This creates additional lift during carrier operations, and enables the variant to carry nearly 20,000lb of internal fuel. **Jamie Hunter**

Below: VX-9 Det Edwards' F-35C CF-08 is an early low-rate initial production airframe that has been heavily modified to accept the latest software standards. **Jamie Hunter**



“Ridge crossing — a Royal Netherlands Air Force F-35A from the Joint Operational Test Team at Edwards AFB, California, as the pilot evaluates high-speed, low-level handling. Frank Crébas/ Rich Cooper COMBAT Aircraft February 2018 Vol.19 No.2 ”

