High Achievers: Test Squadrons, Pilots and Engineers Make Good Systems Work Even Better

A U.S. F-35B Lightning II sits on the forward elevator during testing with the F-35 Patuxent River Integrated Test Force (ITF) aboard the Italian aircraft carrier ITS Cavour (CVH 550) in the Atlantic Ocean March 20, 2021. The testing was part of flight test to expand the safe flying envelope during sea trials for the fifth-generation fighter aircraft and the upgraded Italian Navy flagship. Cavour just completed phase one of its two-phase Ready for Operations campaign. *U.S. NAVY / Dane Wiedman*

Special aviation squadrons conduct developmental and operational testing, as well as scientific research. These squadrons have specialized aircraft along with test pilots, naval flight officers (NFOs), test engineers and other specialists. Qualified test pilots, aircrews and engineers make up a very small percentage of naval aviation, but what they do has a huge impact on the Navy and Marine Corps of today and for many years to come.

The developmental testing squadrons report to the Naval Air Warfare Center Aircraft Division (NAWCAD) and Weapons Division (NAWCWD) – the two warfare centers that support the Naval Air Systems Command (NAVAIR)– and evaluate NAVAIR's aircraft and weapon systems to make sure they do what they're designed to do.

The operational testing squadrons – VX-9 at China Lake, California, for tactical strike aircraft (F/A-18s, EA-18Gs and F-35s) and VX-1 at Patuxent River, Maryland, for rotary and fixed-wing antisubmarine warfare and other maritime aircraft

and weapons – report to commander, Operational Test and Evaluation Force, and evaluate the aircraft and systems and their ability to conduct the mission.

Further tactical experimentation and validation is done at the schools, such as the Navy Strike Fighter Tactics Instructor program at the Naval Strike and Air Warfare Center at Naval Air Station Fallon, Nevada.

“The three organizations have a critical role in coming together to communicate to the program sponsoring the capability and helping them make the right decisions,”said U.S. Marine Corps Col. Richard Marigliano at NAWCAD’s Naval Test Wing Atlantic.

Marigliano is responsible for four aircraft squadrons and the U.S. Naval Test Pilot School (USNTPS), which includes the full spectrum of aviation assets from large four-engine jets to tactical fighters to helicopters, tiltrotors and unmanned aircraft.

“We have about 3,800 people within Test Wing Atlantic, including government and contractor civilians, as well as officer and enlisted military personnel,” he said.

The West Coast wing, Naval Test Wing Pacific, conducts weapons flight testing for NAWCWD, but the squadrons in both wings work together. “It’s not fair to say we just do airplanes and they just do weapons, because aircraft today are a very complex systems-of-systems,” Marigliano said.

“We team an experienced civilian project engineer with a pilot or NFO with recent flying experience and who has completed Naval Test Pilot School,” said Marigliano. “We look at complex systems and see how well they are integrated and networked, with all the interfaces and inter- dependencies. The test pilots and engineers conduct the planning, execution and reporting of the tests to answer the question: ‘Did the Navy buy what it’s supposed to buy, and did it get value?’”

In addition to the test aircraft, simulators and shore-based test beds are also used.

“Some things have to be done in flight, and the tests are conducted on ranges tailored for the type of flying that we do,” Marigliano said. “Sometimes we take advantage of fleet exercise opportunities to conduct testing in more realistic environment.”

F-35B test pilots U.S. Marine Maj. Dylan Nicholas, BF-19, and British Royal Navy Lt. Cmdr. Barry Pilkington, BF-05, perform day envelope expansion test flights aboard Italian aircraft carrier ITS Cavour (CVH 550). The Air Test and Evaluation Squadron (VX) 23 pilots are embarked with the F-35 Patuxent River Integrated Test Force (ITF) for sea trials on the Italian navy flagship in the Atlantic Ocean. Cavour is in phase one of its “Ready for Operations” campaign to certify its use of the fifth-generation fighter aircraft. *U.S. NAVY / Dane Wiedmann*

Focus on the Mission and Aircraft

Capt. Elizabeth Somerville is a naval flight officer and chief test pilot for VX-23, based at Patuxent River. She will assume command of the squadron in July.

“We conduct testing for tactical aircraft, including the F/A-18 Hornet and Super Hornet, EA-18G Growler, T-45 trainer and the F-35, and we will be receiving the MQ-25 Stingray unmanned aerial refueling aircraft when it’s ready,” she said. “We have a tremendous team at my squadron and at the wing here on the East Coast and the West Coast, involving thousands of dedicated professionals. There is a lot of personal investment in develop- mental flight test.”

Somerville said developmental flight testing differs from operational flight testing.

“We come into the acquisition of an aircraft, weapon or software first, as early on in the life cycle of that product

as possible. There has already been a lot of work on that product to get it to this point, and we then take it through its developments and ensure it works and does the job it was designed to do. Our squadron is filled with USNTPS graduates. After developmental test, usually a system will undergo operational test where a squadron will make sure the product meets the mission needs of the fleet."

The departments in her squadron are focused either on the mission or the aircraft, she said.

"We get projects to test aircraft, systems and software, and they can cross multiple departments. We conduct a lot of 'carrier suitability testing.' Not only do aircraft have to be able to land safely on the carrier, but so do all of the systems and components. Everything on that aircraft – each black box, weapon and every little bit of software – has to function in that harsh carrier environment."

VX-23 has a team of engineers who are specialists in a wide variety of disciplines who work with the US-NTPS-trained pilots and NFOs to develop the detailed test plan, which then goes through a review process. "We have experienced test flight engineers and test conductors who monitor the whole series of events in real time to make sure everything is behaving as expected, we're getting the data we need, and we're conducting the testing effectively, efficiently and safely," Somerville said.

According to Somerville, things don't always behave as expected. The systems are so complex and have to be integrated and interoperable. "You can't expect everything to go perfectly the first time," said Somerville. "We're constantly learning and discovering things, and it's important to find things early enough so they can be fixed. We don't want to pass on a capability to the fleet that doesn't do its job. We're here to deliver the warfighter the capability that he or she needs."

Somerville said her team is always looking for opportunities to take systems in mission-relevant environments, such as fleet exercises, to test under realistic conditions and validate the systems. “We leverage ways to test systems without taking an airplane up. We do extensive lab testing and modeling and simulation when we can, which is safer and more cost effective. It costs a lot less to run a simulator for an hour than an aircraft. But sometimes, there’s no substitute for getting that system and that aircraft airborne into its relevant environment and ensuring that it works.”

VX-31, based at NAS China Lake, also does F/A-18 and EA-18G flight testing. “We work with them extensively,” Somerville said.

Lt. Anup Engineer, an E-2D Hawkeye NFO, is a test pilot with VX-20, also based at Pax River. He served with VAW-113 and made three deployments aboard the USS George Washington and USS Ronald Reagan. He was selected for Naval Test Pilot School, and upon graduation joined VX-20 as a project officer. VX-20 is the primary E-2 test squadron, with multiple variants equipped for different testing.

“At USNTPS we learn about organization, math, quantification of data and writing. We learn how to develop a methodological plan to get the test points completed with a minimum amount of resources,” he said. “There is a meticulous test planning process. We need to tell the people who will be flying our flights exactly what data we need them to collect, and we learn to document everything that we observe as pilots or NFOs, all so we can accurately evaluate the system against the requirement, and what the fleet needs.”

The project teams include civilian engineers and technical staff and industry representatives with a wealth of knowledge and experience. But, Engineer said, he’s often one of the few active-duty military people on a

project. “We bring recent fleet experience. We have a set of knowledge that is unique, because we’ve deployed the plane operationally.”

“When you’re in the fleet, you notice things that could be improved upon to make the airplane better. As a development test pilot, I now have a chance to effect new technologies early on, before they’re too mature to be changed,” Engineer said. “I’m working on the latest generation of software that will make a number of improvements to the weapon system, including the radar, communications and data links. My job is about making good systems work even better.”

The U.S. Naval Test Pilot School. *U.S. NAVY*

MIT of Flight Test

“We train aviators and aviation professionals to manage critically important aircraft programs for all of U.S. military services, the Department of Defense and 17 partner nations,” said U.S. Naval Test Pilot School Commanding Officer Lt. Col. Rory “Pikey” Feely, U.S. Marine Corps.

USNTPS has a very involved training curriculum. “We train over 70 students a year. End-to-end, the school has a 55-week cycle time at a minimum, with 47 weeks here in the building. The typical student is already a very accomplished aviator with one to two successful tours in the fleet and usually an engineering, mathematics or physics degree.”

According to Feely, an advanced diploma in flight test from USNTPS requires 530-plus hours in academics, 100 sorties and about 120 flight hours in applied academics in the aircraft and preparation of more than two dozen technical reports. “By the time they leave here they will have flown anywhere from 10 to 15 different aircraft, from helicopters to tail-draggers to jets to gliders.”

Graduates usually report to one of the NAWCAD or NAWCWD

squadrons at Pax River or China Lake, which is why they were selected for USNTPS.

USNTPS has international students and instructors from about 17 or 18 partner nations and provides test pilot training for Army and Air Force rotary wing and tilt rotor pilots. Command of the USNTPS rotates between the Navy, Marine Corps and Army.

“We train a lot of non-pilot engineers,” Feely said. “Our airborne and unmanned students mainly focus on combat systems, and everyone receives some level of unmanned systems training.”

Feely said people think USNTPS has a bunch of really cool aircraft, and it does, “but they are more airborne classrooms and laboratories rather than aircraft. … While some of the USNTPS aircraft are old, it’s not a museum. We don’t do boring. We are doing applied science. We are the MIT of flight test.

“For the capstone project, we tell the students, ‘Here’s your aircraft. Here are the books. Presume you’re the first person to evaluate the aircraft. Write the test plan. Fly the aircraft. Write the report,’” Feely said.

“At the U.S. Naval Test Pilot School, we deal with a lot of high achievers,” said Feely. “Everyone here at the U.S. Naval Test Pilot School, the students and the instructors, have been competitively selected. Not every student who comes here is the next Chuck Yeager, but 90 of our US-NTPS graduates have become astronauts.”