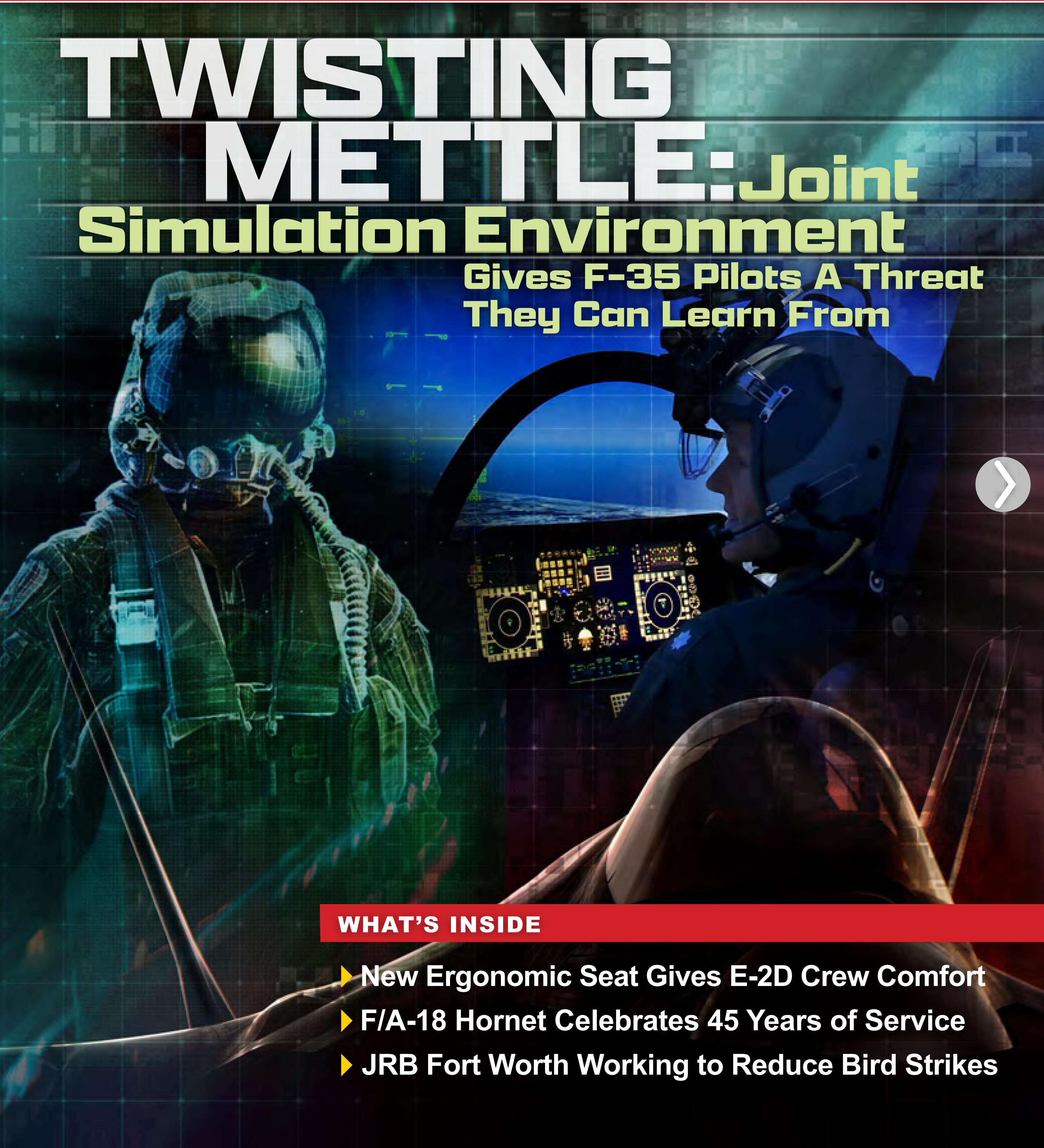
NAVAL AVIATION NEWS

THE FLAGSHIP PUBLICATION OF NAVAL AVIATION SINCE 1917
FALL 2023

TWISTING METTLE: Joint Simulation Environment

Gives F-35 Pilots A Threat They Can Learn From



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- New Ergonomic Seat Gives E-2D Crew Comfort
- F/A-18 Hornet Celebrates 45 Years of Service
- JRB Fort Worth Working to Reduce Bird Strikes


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Marine Corps UH-1Y Venoms and CH-53E Super Stallions assigned to Marine Aviation Weapons and Tactics Squadron One (MAWTS-1), land at a forward arming and refueling point as part of Weapons and Tactics Instructor (WTI) course 1-21, in Twentynine Palms, California.

U.S. Marine Corps photo by Cpl. Juan Dominguez

NAVAL AVIATION NEWS

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DEPARTMENTS

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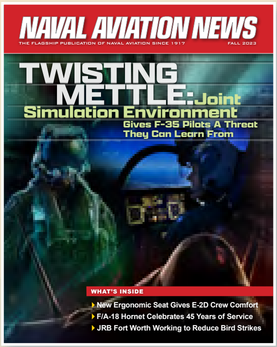

On the Cover: *Naval Air Warfare Center Aircraft Divsion based at Naval Air Station Patuxent River, Maryland, has developed a Joint Simulation Environment trainer to task F-35 Lightning II pilots with fighting and eluding near-peer threats. (U.S. Navy photo illustration by Fred Flerlage; imagery from U.S. Navy photos and videos).*

In this issue of Naval Aviation News, *on page 20, learn about the Naval Air Warfare Center Aircraft Division's Joint Simulation Environment, an elite F-35 Lightning II training simulator that is presenting pilots with advanced near-peer threats they cannot experience in any other existing training environment. On page 32, read about how the new MAVRIC ergonomic seat is allowing E-2D Hawkeye crews more comfort during longer sorties, the result of a project initially funded by Naval Air Systems Command's Small Business Innovation Research Program. The F/A-18 Hornet is celebrating 45 years of flying in the Navy; read about the historic capabilities and milestones this legacy aircraft has marked on page 40. And learn how a simple fix to the F-35 Lightning II's fuel intake is preventing catastrophic engine failure on page 50.*

On the back cover: *Sailors, assigned to the "Blacklions" of Strike Fighter Squadron (VFA) 213, conduct routine maintenance on an F/A-18F Super Hornet in the hanger bay of the world's largest aircraft carrier USS Gerald R. Ford (CVN 78) June 14. (U.S. Navy photo by MC2 Nolan Pennington)*

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Airscoop

Compiled by Rob Perry

NPS Team Makes Key Breakthrough on Path to Electric Aircraft Propulsion

MONTEREY, Calif.—As an institution renowned for innovation efforts grounded in education and research, the Naval Postgraduate School (NPS) has often been called upon to tackle some of the most difficult technological challenges facing the Navy and the nation.

Such a challenge emerged in 2020, when NASA charged NPS and two other research teams with solving a critical barrier facing the development of electric aircraft propulsion (EAP): the creation of a circuit breaker that could support large electric platforms running on direct current (DC) electricity. Thanks to the efforts of a diverse team of faculty and students, as well as several Navy and academic research partners, NPS delivered an innovative working prototype.

This past March, the successful test of the "Navy High Speed Solid-State Fault Management System for Electric Aircraft Propulsion" confirmed the breakthrough results. The NPS-led design was able to provide a viable DC circuit breaker to NASA, pushing the project development forward to Level 6 on the Technology Readiness Level scale—a nine-level measurement system used to assess the maturity of a particular technology.

The effort to research and design the DC circuit breaker for EAP was led by Dr. Di Zhang, NPS Associate Professor of Electrical and Computer Engineering, along with a team of NPS students. Zhang, who came to NPS in 2019 after working on electric power converter designs with General Electric's Global Research Center, is widely considered one of the nation's leading experts on large electric vehicles.

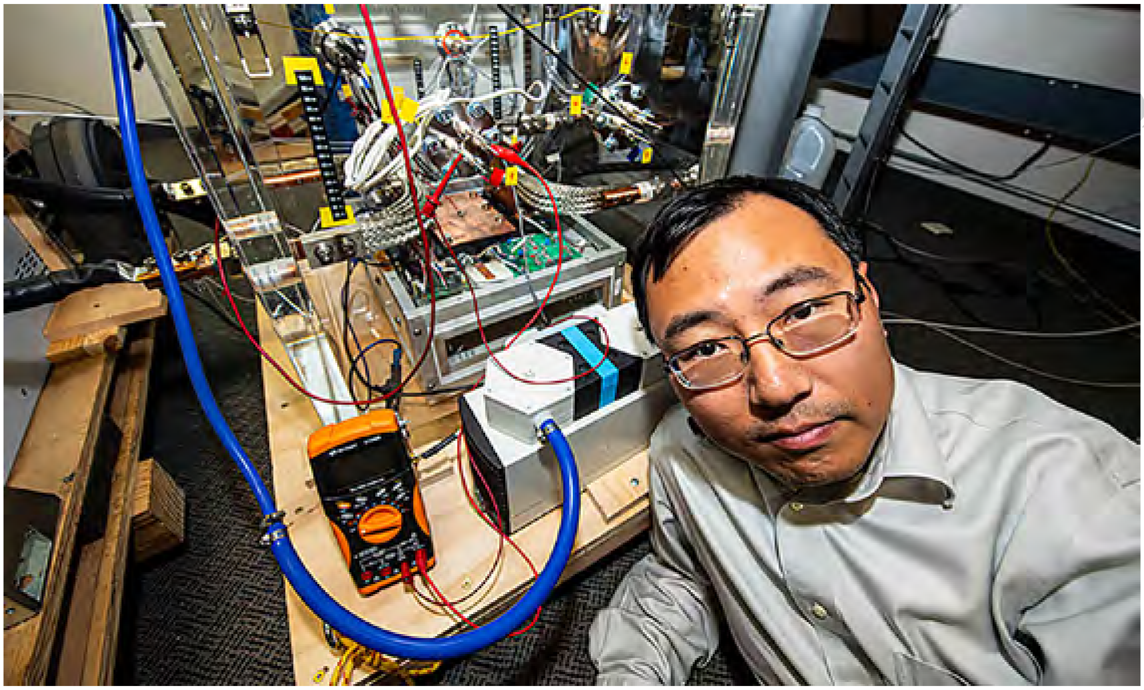
As a result of his team's work, Zhang was awarded a $750,000 research grant by NASA to continue his research with a goal to refine the weight and performance of the team's initial breaker design.

The breakthrough achieved at NPS could be a critical step in the development of EAP, one of many emerging technologies receiving increased attention due to the emphasis placed by the Secretary of the Navy, Carlos Del Toro, on accelerating innovation throughout the Department of the Navy.

NPS will play a significant role in supporting the development of EAP technology and other relevant innovation efforts following the establishment of the Naval Innovation Center (NIC) at NPS. First announced in December 2022, the NIC will leverage NPS education and research to drive "ideas to impact," bringing research concepts out of the lab and into the field faster by empowering students, faculty and partners across the entire Naval Research & Development Establishment (NR&DE) to work with the naval innovation ecosystem and industry.

Accelerated innovation for technologies such as EAP is also facilitated through the Secretary of the Navy's "Climate Action 2030" policy, which prioritizes the development of systems that are not dependent on fossil fuels, expanding the use of renewable energy and electric propulsion.

In addition to supporting Climate Action 2030 and similar policy goals, EAP can also enable numerous new design freedoms and functions, leading to lower energy consumption and higher propulsion efficiency. And, of course, the noise signature of combustion engines could be all but eliminated utilizing EAP, enhancing stealth capabilities of future systems.



U.S. Navy photo

NPS Associate Professor Dr. Di Zhang led a team of NPS students to create and successfully test a circuit breaker that could support large electric platforms running on direct current electricity —a breakthrough in the future development of electric aircraft propulsion.

"Electric propulsion technology is crucial for future Navy capabilities, offering enhanced design flexibility, supporting power-intensive advanced systems, and ensuring stealth, efficiency, and adaptability in evolving naval environments," Zhang said. "The technology's integration also paves the way for the adoption of emerging energy sources, solidifying the Navy's technological edge."

Zhang and his NPS student team were joined in their research efforts by partners from Virginia Tech, Clemson University and the University of Connecticut, and received engineering support from Naval Air Systems Command (NAVAIR) in China Lake, Calif., and the Naval Surface Warfare Center (NSWC) Philadelphia division.

According to Zhang, one of the fundamental questions when looking at utilizing electric power is the distinction between products that run on direct current and alternating current (AC).

"A hundred years ago, Nikola Tesla and Thomas Edison had a battle over the advantages of AC versus DC electric power. Tesla won, and now much of what we use and see is running on AC power," Zhang said.

There are certain advantages to using AC electricity, he said. AC generators are the primary source of electric power, which are driven by steam, nuclear or other power sources. AC can be transmitted across great distances and is also easily changed to different voltage levels through the use of transformers that can step voltage up and down. As its name implies, AC has an alternating current that runs in a sinusoidal pattern; this makes AC electricity relatively safe and easy to interrupt with a circuit breaker as the waveform naturally crosses zero.

Direct current has its own advantages that are rising in importance as technology looks to the future. DC systems require less cabling and can be smaller and lighter than AC systems, as well as more power efficient. Clean sources of energy—like wind and solar—store power in photovoltaic grids and batteries which are inherently DC compatible. Electric cars that use DC power are also able to use regenerative braking to return energy to their batteries, and they are run in a compact space that does not require long distance transmission.

"The trend we're seeing in energy industries and in electric vehicles is this switch to DC, and that's why it is so important to look towards this electric aircraft design," Zhang said. "With DC, we can make a design lighter and smaller with the same power which is critical for aviation and Navy applications. The target for this DC breaker design is to get the same amount of power while cutting the weight to one tenth of what's been developed."

One thing that doesn't get smaller and lighter with DC systems is the circuit breaker. The challenge that NASA posed to NPS was to create a circuit breaker that could shut down an electric aircraft running at maximum power in a safe, simple—and size-efficient—way.

"Think of electricity flowing like water through a pipe. A circuit breaker is the tool you need to shut that water off. With DC, high amounts of current and voltage equate to a huge flow of water that is hard to shut down quickly," said U.S. Marine Corps Capt. Michael Smith, an NPS electrical engineering graduate. "That quick change from a high to low voltage, or high to low current, creates an electromagnetic field that can interfere with other electric systems."

Smith is one of five NPS students who worked on the project with Zhang. Since his graduation in September 2022, he now applies his degree as an Expeditionary Energy Officer for the Marines. His master's thesis focused on testing circuit boards to ensure they could withstand the electromagnetic interference of a large-scale DC circuit breaker, and he was able to successfully identify manufactured circuit boards that would function under the required conditions.

"The trick to reaching industry standards is in the balance," Zhang said. "You need to design something new, but not too new or it is unproven and risky. You cannot only be innovative; you must also be practical. So, we had three years during a global pandemic, which hindered manufacturing and access to technology, to produce a result that is as safe and simple as possible."

In spite of those challenges, the team was able to successfully meet the deadline. While Zhang is pleased with the achievement of his students and the positive feedback from NASA, he is far from done with this research.

"I'm very proud of the students that I've worked with who have shown great ability with hands-on research," Zhang said. "I'm also proud of my team and colleagues here at NPS who have such strong industry experience and perspective towards electrical engineering. It's with this perspective that we're able to deliver something so practical, useful and impactful."

NPS Vice Provost for Research Dr. Kevin Smith complimented Zhang and his research team, noting the achievement as an exemplar of how basic and applied research at NPS leads to relevant technology solutions.

"Di Zhang's accomplishment is a great example of how our faculty lead interdisciplinary research at NPS, leveraging our students' operational insight and our innovation ecosystem of academic and industry partners to solve problems and drive concepts to capability," he said.

From Rosemary Mena-Werth, Naval Postgraduate School Public Affairs.

First Round of Attack Helicopters Arrive in Czech Republic

PATUXENT RIVER, Md.—Two AH-1Z Vipers arrived in the Czech Republic in August, marking the first in-country delivery as part of a partnership with the Marine Corps H-1 Light/Attack Helicopter Program Office and industry partner, Bell.

"Four years ago, we embarked on a journey with the Czech Republic Air Force to deliver the H-1 family of aircraft, including four AH-1Z and eight UH-1Y helicopters," said Col. Vasilios Pappas, program manager. "Since then, we have worked together to award the required contracts, deliver the applicable logistics equipment, develop a training program and so much more, all in preparation for this delivery. This is a remarkable milestone."

In 2019, the Czech Republic selected the H-1 to modernize the country's armed forces and strengthen its homeland defense.

A lot has transpired since the initial contract.

From a training perspective, an initial team of Czech aircrew and maintainers had the opportunity to complete the Marine Light/Attack Helicopter Training Squadron (HMLAT) 303 training pipeline, graduating earlier this year. Beginning this fall, H-1 crews will train alongside representatives from Bell, and its supplier, Pinnacle Solutions, through a "train-the-trainer" model. Pilots, crew chiefs and maintainers will learn the additional skills required to operate and sustain its fleet of AH-1Z and UH-1Y helicopters, and train other members of its force.

In addition, the country has a Flight Training Device (FTD) to support skills development, offering access to the controls and weapon systems for preparation purposes. The Czech Republic FTD broke ground in March 2023 and construction will finish in time to begin training this fall.

Now, with the aircraft in-country, the Czech Air Force can begin the acceptance process and over the next 12 months, additional aircraft will arrive based on the production schedule.

The Czech Air Force squadron is expected to be independently operating in late-2024.

From the Marine Corps H-1 Light/Attack Helicopter Program Office.

U.S. Navy photo

One of two AH-1Z Viper sits in the hangar after arriving in the Czech Republic. Czech Republic selected the H-1 to modernize the country's armed forces and strengthen its homeland defense.

Successful First Test a Big Step for Wing Walker Team

JOINT BASE MCGUIRE-DIX-LAKEHURST, N.J.—A system designed to reduce the number of collisions on aircraft carriers took a significant step forward in the development process when the Wing Walker team from Naval Air Warfare Center Aircraft Division Lakehurst, New Jersey, held its first system test this past summer.

With collisions on deck potentially costing millions of dollars to fix and also decreasing overall readiness, the Wing Walker team spent several years going through various iterations of the system before testing the current model.

Ezra Idy, a robotics engineer in the Robotics and Intelligent Systems Engineering (RISE) lab and leader of the Wing Walker team, said the test was a key milestone in a process that started when he arrived at Lakehurst almost four years ago. Even with the hot summer weather posing its own challenges, Idy said it was a successful day overall.

"Personally, this is my baby," Idy said of the project. "Seeing it from the ground up and actually in action, even with all the issues we had on that day, it was super exciting."

After taking the lead on the team just a few months into the job, Idy said they overcame numerous obstacles over the years before reaching this prototype for the test. Among the issues was how to successfully implement the system without causing problems for the deck crew and tower personnel. Options like lighting, sounds and vibrations as alerts caused their own challenges and were largely addressed in the prototype.

The current Wing Walker system uses sensors mounted on the Shipboard Tow Tractor to identify obstacles on the deck including other aircraft and personnel. Data from the sensors is sent to an augmented reality device used by the aircraft director, while haptic feedback like vibrations alert wing and tail walkers on the deck.

Wing Walker is one of several teams at Lakehurst working to improve safety on the flight deck. Idy noted the PATRIOT team, which is developing a system using cameras on the deck to locate aircraft accurately, works next to them in the RISE lab.

While both projects are relatively early in the development process, Idy said someday they could work in tandem to keep Sailors safe.

The work is funded as a Naval Innovative Science & Engineering (NISE) Basic and Applied Research project, and Idy said he hopes future funding will help move the program forward. Following the first round of testing, Idy said the next steps include devising a system to calculate and display the distance from a towed aircraft to an obstacle, fine-tuning the algorithm and redesigning the hardware.

From the Naval Air Warfare Center Aircraft Division Lakehurst, New Jersey, public affairs.

U.S. Navy photo

The Wing Walker team at Naval Air Warfare Center Aircraft Division Lakehurst held its first successful test of a system designed to reduce costly crashes on aircraft carriers.

Teamwork Delivers New Capabilities in Support of E-6B Mercury's Nuclear–Deterrence Missions

TINKER AIR FORCE BASE, Okla.—Extensive teamwork and coordination recently delivered new communications equipment for aviators conducting missions in support of our nation's nuclear command, control and communications.

The equipment will allow the E-6B Mercury to conduct troubleshooting, maintenance, security requirements and upgrades from the ground, saving flight hours, fuel and money. The result is a greater number of mission-capable aircraft, ready to deploy at a moment's notice.

Bringing the six-year project to fruition was a joint effort by the Airborne Strategic Command, Control and Communications Program Office (PMA-271), Strategic Communications Wing One, L3Harris, the Air Force Nuclear Weapons Center and the "Take Charge and Move Out" (TACAMO) Weapons School.

The team completed installing and testing the communications equipment in April 2023, and delivered the capability to the fleet the following month, marking the occasion with a ribbon-cutting on May 3, 2023.

"It was a proud moment for all involved and a great accomplishment for the team," said Laura Young, who was the Integrated Product Team Lead for PMA-271 Wideband Systems during the project. "Together we have completed a monumental achievement in providing this critical network connection. Thank you to all who provided support in making this happen."

The E-6B Mercury is a communications relay and strategic airborne command post aircraft. It executes the TACAMO mission, connecting the president and secretary of defense with naval ballistic missile forces during times of crisis, and the Looking Glass mission, which facilitates the launch of U.S. land-based intercontinental ballistic missiles using an airborne launch control system.

It is flown by Navy Fleet Air Reconnaissance Squadrons 3 and 4 (VQ-3 and VQ-4) out of Tinker Air Force Base.

The E6-B Mercury fleet has been undergoing upgrades, dubbed Block II, including the installation of a Multi Role-Tactical Common Data Link (MR-TCDL). With the installation of that system, the fleet recognized an ability to connect the data link from the transient flight line would improve mission effectiveness.

"Delivering enhanced capabilities to the fleet is what we do," said Capt. Adam Scott, PMA-271 Program Manager. "The fleet identified an operational need, and we came together with industry to deliver a solution that will save flight hours and ensure our aircraft and warfighters are always mission-ready."

In addition, as part of this project, the PMA-271 engineering team collaborated with fleet personnel at the TACAMO Weapons School and Air Test and Evaluation Squadron 20 to identify and implement additional improvements that would simplify the operational requirements for sailors sitting at the MR-TCDL terminal onboard the aircraft.

From the Airborne Strategic Command, Control and Communications Program Office.

Marine Corps XQ-58A Valkyrie Completes First Flight

A Marine Corps XQ-58A Valkyrie, highly autonomous, low-cost tactical unmanned air vehicle, soars overhead during its first test flight at Eglin Air Force Base, Florida, Oct. 3.

U.S. Marine Corps photo by Master Sgt. Tristan McIntire

U.S. Navy Photo by Aviation Electrician 2nd Class Monica Walker

Members of the Airborne Strategic Command, Control and Communications Program Office, Strategic Communications Wing One (SCW-1), L3Harris, the Air Force Nuclear Weapons Center and the "Take Charge and Move Out" (TACAMO) Weapons School participate in a ribbon-cutting for new communications equipment at Tinker Air Force Base, Oklahoma, on May 3. At bottom right, SCW-1 Deputy for Communications Lt. Cdr. Paul Brazier and Laura Young, then-Integrated Product Team Lead for Wideband Systems, cut the ribbon.

HEADQUARTERS, U.S. MARINE CORPS—The Marine Corps XQ-58A Valkyrie, a highly autonomous, low-cost tactical unmanned air vehicle successfully completed its first test flight Oct. 3, at Eglin Air Force Base, Florida. The Marine Corps partnered with the Office of the Undersecretary of Defense for Research and Engineering (OUSD(R&E)), the Naval Air Systems Command (NAVAIR) and Naval Air Warfare Center Aircraft Division (NAWCAD) to facilitate the ongoing research, development, test and evaluation of the Marine Corps XQ-58A Valkyrie.

This joint collaboration was supported by the Air Force's 40th Flight Test Squadron, 96th Test Wing, and the NAWCAD. This flight marks a key milestone in the Marine Corps' Penetrating Affordable Autonomous Collaborative Killer-Portfolio (PAACK-P) program. Future test flights inform Marine Corps XQ-58A Valkyrie requirements for the Marine Air-Ground Task Force Unmanned Aerial System Expeditionary (MUX) Tactical Aircraft (TACAIR).

"This XQ-58A test flight and the data collected today not only help to inform future requirements for the Marine Corps," said Scott Bey, a prototyping and experimentation portfolio manager at OUSD(R&E). "It fuels continued joint innovation and experimentation opportunities and demonstrates the agility that can be achieved through partnership."

The aircraft performed as expected. The XQ-58A has a total of six planned test flights with objectives that include evaluating the platform's ability to support a variety of intelligence, surveillance, and reconnaissance (ISR) missions; the effectiveness of autonomous electronic support to crewed platforms; the potential for AI-enabled platforms to augment combat air patrols; and continuing to mature other manned-unmanned teaming (MUM-T) capability objectives.

The Marine Corps received the first of two XQ-58A unmanned aerial systems (UAS) on March 14 to support platform prototyping and integration efforts for the PAACK-P program.

"The Marine Corps constantly seeks to modernize and enhance its capabilities in a rapidly evolving security environment," said Lt. Col. Donald Kelly, Headquarters Marine Corps Aviation Cunningham Group and Advanced Development Team. "Testing the XQ-58 Valkyrie determines requirements for a highly autonomous, low-cost tactical UAS that compliments the need for agile, expeditionary and lethal capabilities in support of both the Marine Corps' stand-in force operations in austere environments and the Joint Force."

From Headquarters, Marine Corps.

Safety Pilot Program Tackles Launching and Arresting Aircraft

PATUXENT RIVER, Md.—Commander Naval Air Forces and Headquarters Marine Corps have brought a heightened awareness to Naval Aviation safety to prevent mishaps. In response, the Naval Aviation Enterprise has been improving safety management processes, tools and methods to be more data driven. Several pilot programs are underway to test and mature these new approaches. One of the four pilots is spearheaded by the Aircraft Launch and Recovery Equipment (ALRE) Program Office, which executes the timely development, acquisition and sustainment of ALRE systems onboard all ships operating aircraft from their flight decks. The program office is responsible for all systems and equipment used to launch and recover fixed and rotary-wing aircraft. For their pilot, the program office has decided to focus on catapults and arresting gear that support Ford- and Nimitz-class carriers. These systems were selected due to their consequence of failure.

To launch the effort, the program office pilot team members held a Class Desk Safety Review (CDSR) in July and a System Safety Working Group (SSWG) meeting in August. These two working-level forums are part of a monthly safety drumbeat in the new governance structure designed to maintain progress on risk mitigation that delivers improved safety outcomes for the fleet. These forums also prioritize topics for quarterly Program Safety Review Boards (PSRBs), where resource and priority decisions are made.

CDSRs and SSWGs review recent mishaps; discuss close calls (also referred to as near misses), status progress of investigations and mitigation plans; evaluate safety data and look for trends—all to prevent mishaps.

"Our traditional steam-driven catapults and new electromagnetic system, along with the rest of the launch and recovery equipment, play heaviest in safety concerns and how the flight deck operates," said Capt. Mike Kline, program manager.

Less than three months into the effort, results from incoming data sources for these commodities are different than those for an aircraft platform. Safety operations and other teams are gathering data to evaluate ALRE information. The team has discovered that valuable safety records of ALRE may reside in an aircraft hazard report, a maintenance record held by the Naval Sea Systems Command, or in the memory of a sailor assigned to the equipment. This kind of information disbursement has exposed areas for data storage and gathering improvement.

A pivotal component of this initiative is the alignment of safety protocols and communication. The program aims to fortify safety protocols and governance structures, driven by the imperative to curtail incidents that cause fatalities, injuries and asset losses.

The challenges of analyzing safety incidents span numerous key performance indicators, including system performance, personnel training, operational tempo and individual factors. Although the culture of safety has a positive record of documenting and reporting safety issues, the challenge is in determining the root cause or causes for each incident.

"While some parameters that can contribute to safety events may be unique, basic data challenges in safety governance are not," Kline said. "Having the right data at the right time easily captured and efficiently extracted are common goals more easily stated than achieved. The program office and other pilot programs are on a path to get closer to this desired operating model."

Courtesy of Naval Aviation Enterprise News.

Aircraft Launch and Recovery Equipment (ALRE) Sailors man an arresting gear wire on the flight deck of USS Harry S. Truman (CVN 75) during a scheduled deployment.

U.S. Navy photo

VP-45 Conducts First All-Female Flight with Support from an All-Female Ground Maintenance Crew

JACKSONVILLE, Fla. —Patrol Squadron (VP) 45 conducted its first all-female flight Sept. 21 aboard a P-8A Poseidon aircraft out of Jacksonville.

A total of 12 aircrew consisting of eight officers and four enlisted Sailors participated in a training flight above the skies of Jacksonville to train the future of Naval Aviation. In addition to the aircrew, an additional five female ground crew served various maintenance roles to ensure the aircraft met all requirements and was safe for flight.

Lt. Sarah Hoffman, aircraft commander for the flight, discussed reaching this milestone which was three years in the making for her fellow aviators, Lt. Sahara Graft and Lt. Kelsey Smallwood.

"This was such an incredible flight for us. When Kelsey, Sahara and myself checked into VP-45 almost three years ago, we hoped one day we'd be able to conduct an all-female mission flight," Hoffman said. "We knew it would be difficult to get nine qualified aircrew to fill all of the roles and also be able to schedule us on the same flight with the many demands this job has day-to-day…so to be able to have both maintenance and aircrew be entirely female is something I'll never forget."

The flight was special for Hoffman, in that one of her other fellow aviators, Lt. j.g. Alissa Mcnair, hailed from the same hometown as Hoffman.

Senior Chief Aviation Machinist's Mate Jackie Backlund certified the aircraft safe for flight.

"I think it is pretty exciting, it is absolutely rare to see an all-female crew to execute the flight from start to finish," Backlund said. "On our day-to-day requirements, we have maintenance to get done and we execute; however, when I found out it was an all-female flight and I was asked to release the aircraft safe for flight, I thought it was pretty awesome."

U.S. Navy photo

Patrol Squadron (VP) 45 conducted its first all-female flight aboard a P-8A Poseidon aircraft out of Jacksonville, Florida, Sept. 21. A total of 12 aircrew consisting of eight officers and four enlisted Sailors participated in a training flight to train the future of naval aviation. An additional five female ground crew served various maintenance roles to ensure the aircraft met all requirements and was safe for flight.

Backlund's role at VP-45 as the maintenance control supervisor is to ensure all maintenance operations are executed safely and efficiently for their seven P-8A aircraft and provide mission-capable aircraft for aircrew training and readiness. Backlund has been serving in the Navy for 23 years.

"Twenty three years ago I would never have imagined that this type of flight or support from the ground from an all-female team would occur," Backlund said.

Graft who assisted with the training flight further discussed the mentorship leading up to this point in her naval career.

"The first female instructor pilot that I had flown with has had such an impact on me because not only was she an incredible instructor pilot, but also because it wasn't until over two years of flight training that I finally had a female instructor," Graft said.

Smallwood, a naval flight officer, served as the mission commander, reflected on the experience several years in the making.

"It was an incredible experience to be a part of a flight with an all-female aircrew and it was even better that the maintenance team to release the aircraft was also all-female. I'm incredibly grateful to Skipper Zdunkiewicz for his support and the opportunity to be a part of this flight," Smallwood said. "It's one flight I will remember for the rest of my life. This was an incredible flight that I will never forget, and it is incredibly humbling and exciting to take part in a historic milestone for VP-45. I am also truly grateful to our wonderful ladies who all took part in the flight today, both flying and launching and recovering the aircraft."

Cmdr. Michael A. Zdunkiewicz, VP-45 commanding officer emphasized the milestones achieved with their first flight.

"As a father of a daughter, all of the VP-45 women continue to pave the way to the future for not only Naval Aviation, but the Navy as a whole," Zdunkiewicz said. "So very proud, honored and humbled by their accomplishment today and so very honored to serve with this outstanding team."

The aircrew participating in this flight included: Hoffman, Graft, Smallwood, Lt. Eliza Austin, Lt. Ashley Heath, Lt. Savannah Clarke, Lt. j.g. Aubrey Ossenmacher, Mcnair, Naval Aircrewmen (Operator) 2nd Class Alexia Heninger, Naval Aircrewmen (Operator) 2nd Class Evelyn Valenzuela, Naval Aircrewmen (Operator) 2nd Class Paige Rossi and Naval Aircrewmen (Operator) 2nd Class Savannah Murray.

The maintenance crew consisted of Backlund, Aviation Ordnanceman 1st Class Natalie Martin, Aviation Machinist's Mate 2nd Class Alia Teamer and Aviation Electronics Technician 2nd Class Kaitlyn Kaluzny.

From Jennifer Cragg, Naval Air Force Atlantic Public Affairs.

U.S. Navy photos by Chief Petty Officer Shannon Renfroe

Secretary of the Navy Carlos Del Toro presents the Distinguished Flying Cross and the Air Medal posthumously to Petty Officer Peter L. Smith.

James Smith holds a photo of his father, Peter, during an awards ceremony at the Intrepid Sea, Air & Space Museum in New York City.

SECNAV Del Toro Presents Posthumous Distinguished Flying Cross to WWII Hero

NEW YORK—Secretary of the Navy (SECNAV) Carlos Del Toro honored a World War II hero Aug. 16, presenting the Distinguished Flying Cross and Air Medal awards posthumously to Peter L. Smith.

Smith's son, James, accepted the awards on his father's behalf during a ceremony aboard the Intrepid Sea, Air & Space Museum in New York.

"My father, like many thousands of his generation during the war, did his job day in and day out. In less than four years, his dedication led to defeating the Nazis and the empire of Japan concurrently," James Smith said.

Del Toro thanked James Smith for "his tireless work to ensure his father received the recognition he deserved, and for preserving his father's story of service during World War II."

Aviation Radioman Third Class Petty Officer Peter Smith, a Troy, New York native, enlisted in the Navy on Feb. 2, 1942, two months after the Japanese attacks on Pearl Harbor. First rated as a storekeeper, Smith volunteered for flying duty, completing training as both an aviation radioman and an air gunner.

In June 1943, Smith was assigned to Composite Squadron (VC) 28, based at Henderson Airfield on Guadalcanal. During his time there, Smith flew as a member of a three-man crew in a TBF Avenger torpedo bomber and conducted 15 combat missions in support of troops on the ground at New Georgia. After returning to the U.S., Smith later re-deployed to the Pacific in 1944 with the newly-designated Torpedo Squadron (VT) 28, operating as a carrier-based squadron off USS Monterey (CVL 26). During his time with VT-28, Smith flew in operations to retake Marianas, Saipan, Tinian and Southern Palau from Japanese forces. He also supported the assaults on the Philippines and strikes against Okinawa. All told, Smith flew more than 150 combat and support missions during his 11 months with VT-28, before being honorably discharged in February 1946, after the conclusion of the war.

"I am humbled by the opportunity to honor Peter L. Smith—one of our Navy's hundreds of thousands of World War II Veterans—for his service to our nation during a defining period in world history," Del Toro said. "After the war, Smith, like so many members of this greatest generation, returned to their civilian careers, but forever remained proud of their service."

James Smith thanked Del Toro on behalf of his father, calling the award presentation "a great honor for which our family is thankful."

Congress established the Distinguished Flying Cross, July 2, 1926. It may be awarded to any Navy, Marine Corps or Coast Guard personnel, while serving in the capacity of the Armed Forces, who distinguish themselves for heroism or outstanding achievement while participating in aerial flight.

The Air Medal is awarded for sustained performance while participating in aerial flight under combat conditions.

In receiving the Distinguished Flying Cross, Petty Officer Smith joins the ranks of Charles Lindbergh and the Wright Brothers, as well as fellow Navy recipients President George H.W. Bush and Sen. John S. McCain.

"To Petty Officer Smith's family, I am confident there is no doubt in your minds that his actions met the criteria above for these two awards. His devotion to duty in support of his fellow Sailors, Marines, Airmen and Soldiers was indeed unwavering throughout his time in service, and I have no doubt you take pride in his accomplishments to keep our nation free," Del Toro said.

Grampaw Pettibone

Gramps from Yesteryear: Fall 2013

Illustration by Ted Wilbur

Harrowing Harriers

A section of AV-8B Harriers was scheduled to fly a day training sortie and hot pit, and then perform night carrier qualification to regain currency. Shortly after takeoff, the mishap pilot reported to his lead that he had a fuel flow proportioner, or PROP, caution. He secured the PROP system and balanced the fuel manually in accordance with NATOPS procedures. After landing from the day event, the mishap pilot, his flight lead, and the squadron landing signal officer (LSO) discussed the situation and decided to continue the mission and launch the aircraft into the pattern for the required night landing. A fuel proportioner malfunction is a downing discrepancy, a fact known to all three.

Because of an unrelated malfunction, the flight lead's aircraft was shut down prior to the night event. After taking on fuel and water, the mishap aircraft was launched into the Case III pattern for his night landing. Approximately 2 miles from landing, the engine RPM began to fluctuate. The pilot executed his NATOPS immediate action items and initiated a wave off. After climbing to 1,500 feet, the pilot reported his RPM was fluctuating between 75 and 95 percent and began a turn downwind to enter the Case I pattern. After turning off of the 180, the aircraft descended below glide path. Passing the 90, the pilot selected full power and leveled his wings, but could not arrest his rate of descent. The pilot ejected at approximately 40 feet above ground level.

Grampaw Pettibone says…

Only two good things can come from this kind of knuckleheadery. The first one is we got that fine Marine out of the briny not too worse for the wear. The second is that you kids will hopefully learn something that may keep you from making the same mistake. Heck, that's what we do here in Gramp's house, right?

Back when Gramps was an instructor, we had an adage: "Live to fly, die for the 'X.'" We said it jokingly—but only half jokingly—'cause after all, what kind of Naval Aviators would we be if we didn't get the job done for the old man? But there's a line kids, and these gents were so far beyond it they didn't even know where it was! Gramps loves me some hard charging Marines (is there any other kind?) but gee-whiz, there weren't bad guys coming over the horizon, this was C-darned-Q. It was nothing but a training mission and three smart, disciplined, and highly trained aviators all thought it was ok to launch that jump jet on a demanding night evolution, even though it wasn't really airworthy—and that just don't make sense.

So come here kids and let's talk about what's important here. We get paid to take risks, sometimes extreme risks, but a training sortie ain't the time to do it. Training's important, but it ain't so important that you should unduly risk your air machine, much less your hide.

Now you kids run along, Gramps is gonna wander down to the barn and muck some stalls.

F-35 Test Team, HMS Prince of Wales Ship's Company Working Closely to Achieve DT-3 Goals

By Michael Land

The autumn mix of red, brown, yellow and green reflective and life preserver vests are muted under still dim hangar lights as two separate teams unstrap and unchain the Wildcat HMA Mk2 maritime attack helicopter, with its next-generation versatility, and the F-35B Lightning II fighter aircraft, with its fifth generation capabilities, before moving the aircraft to the aft lift.

It's not quite 6:30 a.m. Through the open hangar doors, it is still pitch black when the mosaic team of the HMS Prince of Wales hangar security and aircraft handlers, and the Naval Air Station Patuxent River, Maryland, F-35 Integrated Test Force (PAX ITF) maintainers work in tandem to carefully move the aircraft onto the platform. Clinking chains are easier heard than seen as they secure the aircraft to aircraft tie-downs. After several Royal Navy sailors raise stanchions the lift alarm blares alerting everyone another working day is already well underway aboard Britain's newest aircraft carrier.

It takes an integrated team to successfully conduct F-35B developmental phase 3 (DT-3) flight trials aboard the U.K.'s biggest warship. Two or more teams combining into one begins with a willingness to do so, two-way communication, detailed planning and thorough preparation that continues throughout execution. Two weeks into this deployment, the PAX ITF test team and HMS Prince of Wales (R09) ship's company are bearing the fruit of work done before they got underway, and, bearing down—together—on the goals for the trials.

Getting aboard the ship in Norfolk, Virginia, in early October, much less achieving a close working relationship, took a significant effort on both port and starboard sides of the Atlantic.

"Bringing almost 200 people aboard and having them assimilate with the ship in a matter of days was an incredible feat," said Andrew Powers, detachment integrator, PAX ITF Detachment Operations. "It required patience, understanding and an eagerness to perform from both sides."

DT-3 planning went through many stages and was carried out by a by an incalculable number of teams and personnel, Powers said. "Each handover to the next stakeholder brought with it new insights and considerations, and required great attention to detail. By communicating regularly and openly throughout

Marine Corps Test pilot Maj. Paul Gucwa from Air Test and Evaluation Squadron (VX) 23 flies an F-35B aboard HMS Prince of Wales in support of the final First of Class sea trials for F-35B test (DT-3) on Oct 11.

U.S. Navy photo by Dane Wiedmann

the process, we ensured that everyone was operating to the same expectations and in pursuit of the same objectives," he said.

Powers called the process of combining into one team "a flexible one, requiring communication and a willingness to adapt from all involved. With a team of this size, you cannot account for every variable. It takes a mutual understanding between the ITF and ship to ensure we are jointly executing toward our goal."

Additional warfighting ability is the desired outcome of DT-3 and execution of the test plan has been a focus area for ship leaders since the beginning.

"Working relationships are professional, cordial and cooperative," said Royal Navy Lt. Cmdr. Kevin Roffey, Senior Air Engineer, HMS Prince of Wales (PWLS) Air Engineering Department (AED). "AED and ITF are working together to achieve DT-3 goals."

These connections and integration are due, in part, to a long period of DT-3 planning and concept of operations (CONOPS) development, he said.

In his role, Roffey directs and manages the department to support embarked aviation, ensuring operational capability to the AED commander. In addition to the F-35s aboard, RN helicopter squadron personnel and equipment are on board, making for a dynamic environment.

While the sailing is smooth now, there was churn at first as there is with many teams new to working together. The challenges included communicating to the right people at the right time and aligning ITF flight trials requirements and schedules with the ship's routines, Roffey said.

> "Additional warfighting ability is the desired outcome of DT-3 and execution of the test plan has been a focus area for ship leaders since the beginning."

As the two partners learned and adapted, they worked to "get to a position where AED/ITF … have coordinated scheduling." Roffey characterized as "especially important" the ITF settling into routines onboard and PWLS getting used to the test team's requirements and demands, which are different than standard tactical operations, to achieve DT-3.

A fortnight on, air engineers and the test team share a "confidence in the reliability of each element of the integrated team," Roffey said. They have a common understanding of requirements and priorities of each element of the integrated team, and have suitable communications to pass information and respond to challenges, he said.

A key planner who worked on the test plan also said talking with each remaining "Semper Gumby" was important.

"The PWLS owns the ship and airspace, and our team at the ITF have depth of knowledge on the F-35B. We are both experts in our respective fields and will come together to provide future extended capabilities beyond the current (IOC(M))."

"Communication has been key, and there is a need to be flexible to adapt to this nonstandard test environment," said Andy Pekarek, DT-3 project engineer, PAX ITF Basing and Ship Suitability (BASS).

"The PWLS crew have been understanding and receptive of our requests," he said. "We worked through initial expected challenges but the team has grown to be well integrated."

"The PWLS owns the ship and airspace, and our team at the ITF has depth of knowledge on the F-35B," Pekarek said. "We are both experts in our respective fields and will come together to provide future extended capabilities beyond the current Initial Operating Capability (Maritime), (IOC(M))."

As a member of BASS, a team comprised of two

U.S. Navy Sailors from Air Test and Evaluation Squadron (VX) 23 and British navy sailors inspect an F-35B Lightning II during flight training aboard the Royal Navy aircraft carrier HMS Prince of Wales (R09) in the Atlantic Ocean, Oct. 24.

F-35 Test Pilot Flies First Roll-On, Night Landing Aboard HMS Prince of Wales

U.S. Navy photo by Kyra Helwick

U.S. Marine Corps test pilot Maj. Paul Gucwa performs a vertical landing (VL) in an F-35B Lightning II. Gucwa also performed the first night shipborne rolling VL (SRVL) during the evening's flight period.

An F-35 Lightning II test pilot performed the first roll-on landing of an F-35B fighter jet Oct. 19 aboard the HMS Prince of Wales aircraft carrier off the U.S. Eastern Seaboard. The pilot also performed the first night shipborne rolling vertical landing (SRVL) just after 9 p.m. Oct. 29.

Marine Corps Maj. Paul Gucwa piloted the short takeoff vertical landing (STOVL) variant of the fifth generation strike aircraft for the first SRVL aboard HMS Prince of Wales, Britain's biggest warship, as part of developmental test (DT) phase 3 flight trials during the ship's deployment to the Western Atlantic for WESTLANT 2023.

"It was a wonderful experience to see our training and preparation lead to a predictable and comfortable outcome," Gucwa said. "Expanding on the initial work the team executed during DT-1 and DT-2 is the next step in providing these types of increased capabilities to the warfighter, which is what flight test is all about" he said.

F-35B pilots usually approach the carrier from the port side to a position adjacent to a landing spot. They then transition, or fly sideways, to the landing spot and land vertically. More than looking and sounding different, the landing technique could lead to tactics where a pilot returns to the ship with heavier loads, which could include more fuel or weapons. — *Michael Land*

U.S. Navy photo by Kyra Helwick

U.S. Navy photo by Dane Wiedmann

An F-35B from Air Test and Evaluation Squadron (VX) 23 flies an approach for a landing aboard HMS Prince of Wales in support of the final First of Class sea trials for F-35B test (DT-3) on Oct. 11.

engineers in flying control (FLYCO) and on the bridge, and one engineer for precision approach landing system (PALS) approach in Carrier Air Traffic Control Center (CATCC), Pekarek's primary role onboard in FLYCO during all flight operations includes communicating test points and test conditions between engineers in the ITF control rooms and the ship's personnel, and his counterpart in the bridge.

From his perch in the aft island overlooking the flight deck, what he can't see, and what is generally less visible, are the goings on in the aircraft hangar.

"Within my environment, challenges have been quickly overcome with good communication, such as additional training on ship's aviation facilities," said Royal Navy Warrant Officer 2 Christopher Owens, Hangar Control Officer, Air Engineering Department, HMS Prince of Wales.

Owens' responsibilities include deconflicting whole ship department use of the hangar and ensuring that when aircraft are embarked the space is "aviation ready" in all respects, he said. He is also responsible for ensuring that hangar activities are carried out by the integrated team in accordance with

U.S. Navy photo by Kyra Helwick

The PAX ITF test team and HMS Prince of Wales ship's company work closely to achieve DT-3 goals.

U.S. Navy photo by Kyra Helwick

An F-35B Lightning II short takeoff vertical landing (STOVL) variant fighter jet piloted by a test pilot performs a shipborne rolling vertical landing aboard U.K. aircraft carrier HMS Prince of Wales Oct. 24.

the relevant standards, and for enforcing appropriate safeguards to ensure the safety of personnel, equipment and systems during peace time, and any risks and hazards are kept as low as reasonably practicable, or ALARP, during wartime or conflict ensuring airworthiness, he said.

"It is an extremely courteous and professional environment from both RN and ITF," Owens said. "The combining of teams is important as different skillsets are always required to complete certain tasks and overall aim."

He gives an example of how the groundwork for success during sea trials was laid before the ship set sail from Norfolk Naval Station, Virginia, Oct. 8.

"Prior to embarkation a comprehensive load plan was provided by ITF and through various meetings we were able to determine available space and which logistic containers required emptying, allowing immediate allocated positioning of all ITF equipment," Owens said. "The onload process was extremely efficient with the ITF logistics team integrating with the hangar team immediately. This enabled correct allocation of working areas to establish rapid operational capability."

Elsewhere on the ship, there is a hefty mission where teams' close work delivers munitions from the deep magazines in the belly of the ship to the upper deck. It is one of the most attention-garnering tests of the flight trials: the F-35B flying with tens of thousands of external and internal weapons.

"The two major ordnance test points [max and heavyweight] were achieved," said Royal Navy Lt. Josh Morris, Air Weapons Officer, HMS Prince of Wales AED Air Weapons Section. "This would have not been possible without the positive attitudes from ITF, U.S. Navy (USN) and RN with the motivation to deliver."

Morris, call sign "Bombs," leads both the Air Weapons build teams (Air Weapons Party) and the Highly Mechanised Weapon Handling System (Highly Mech). These two sections are ultimately responsible for getting munitions to the flight deck, he said.

The weapons-related test points provided a case study in interoperability between the jet and the ship, and integration between the weapons teams. U.S. F-35s were launched from a Royal Navy warship with American air ordnance that RN personnel had readied in the ship's weapon prep areas with its equipment.

The USN ordnance build teams from the USS John C. Stennis (CVN 74) aircraft carrier have been an important element of helping PWLS build and deliver ordnance to the flight deck, Morris said.

"Once the [U.S. Sailors] embarked alongside it was important to identify differences and understand how to adapt to them. We adopted a crawl, walk, run mentality working alongside the Sailors, and we were able to build that trust and understanding in one another step by step."

"The two sections have an open line of communication and full trust in one another," he said. "This trust enables the reliance on each other, which allows for an effective and efficient process of working toward the objectives."

On the importance of integration, Morris said, "Without one, the other cannot achieve and vice versa. They rely totally on the skill and competency of the other teams to enable the single objective being achieved.

"All the parties come with unique knowledge which when combined allows for success. When not building weapons for the ITF test points, the RN and USN are conducting joint training to allow for any challenges or potential learning points to be identified early. 'Train Hard, Fight Easy,'" he said.

Michael Land is a public affairs officer for the Naval Air Station Patuxent River, Maryland, F-35 Lightning II Integrated Test Force.

UK ITF Members Train PWLS Ship's Company in Air-To-Air Missile Ground Handling Operations

U.K. weapons personnel embedded with the Naval Air Station Patuxent River F-35 Integrated Test Force (PAX ITF) recently carried out essential training with HMS Prince of Wales (R09) personnel in ground handling operations for the Meteor beyond visual range air-to-air missile (BVRAAM) aboard Britain's biggest warship during developmental test phase 3 (DT-3).

The training on the next-generation BVRAAM system is in preparation for full operational capability (FOC).

The missile, which brings together six nations with a common need to defeat the threats of today as well as the future emerging ones, is designed to revolutionize air-to-air combat in the 21st century, according to the weapon system's manufacturer, MBDA, a missiles and missile systems company.

The team was able to assess the ship's suitability to prep and store the missile whilst also delivering handling training and capability briefs, explained Royal Air Force Squadron Leader Simon Stafford, U.K. weapons lead, PAX ITF, who led the team.

"Meteor operations on F-35 will provide the U.K. Carrier Strike Force with beyond-visual-range capability, enhancing the U.K.'s F-35B weapon arsenal," Stafford said.

As part of the training, Meteor lead NCO Acting Sgt. Dan Housden briefed the ship's head of air engineering, Royal Navy Cmdr. Jamie Elliott, on the missile characteristics.

Additionally, weapons team members Chief Technician Darrel Crane and Petty Officer Nathaniel Bicker embarked to support this trial iteration. They assessed the ship's suitability to prep, store and deliver enhanced electronic countermeasures in preparation for HMS Prince of Wales' participation in a carrier strike group deployment in 2025.

The first phase of the Operational Testing and Evaluation (OT&E) campaign of the Beyond Visual Range Air to Air Missile (BVRAAM) Meteor took place in recent weeks at Hebrides Range in the United Kingdom, according to reporting by EDR Magazine, which pays special attention to European defense-related matters.

"Guided by an advanced active radar seeker, Meteor provides all weather capability to engage a wide variety of targets from agile fast jets to small Unmanned Aerial Vehicles and cruise missiles. It is designed to meet the most stringent of requirements and is capable of operating in the most severe of clutter and countermeasure environments," according to the description provided by the manufacturer on its web site.

"The weapon is also equipped with data link communication. Aimed at meeting the needs of a network centric environment, Meteor can be operated using third party data, enabling the Meteor user—the pilot—to have the most flexible weapon system."

— *Michael Land*

U.S. Navy photo by Kyra Helwick

It takes an integrated team to successfully conduct F-35B developmental phase 3 (DT-3) flight trials aboard the U.K.'s biggest warship. Two or more teams combining into one begins with a willingness to do so, two-way communication, detailed planning, thorough preparation, and continues throughout execution.

TWISTING METTLE: Joint Simulation Environment

Gives F-35 Pilots A Threat They Can Learn From

By Rob Perry

A new training simulator at the Naval Air Warfare Center Aircraft Division (NAWCAD) is stressing out F-35 Lightning II pilots in a good way.

The Joint Simulation Environment (JSE) has been operational at NAWCAD, located at Naval Air Station Patuxent River, Maryland, for nearly two years. The simulator, which was installed inside an existing NAWCAD building, has drawn so much attention due to its ability to display near-peer fifth-generation threats in a virtual environment that training at the facility has been added to the syllabus for top tier pilots who train at the Navy Strike Fighter Tactics Instructor Course—better known as TOPGUN.

Built by NAWCAD for use across the Department of Defense, the JSE is a hyper-realistic simulation environment made up of both hardware—including cockpits, domed simulators with 4K projectors—and software to form a high-fidelity digital range used to train tactical pilots, and test new defense technology in near-exact virtual battlespaces. The idea to build the simulator came out of a need to fully test F-35 capabilities and pilots.

"There was acknowledgement across the DoD that our open air ranges where aircraft would normally fly operational test missions did not possess the complexity nor the density of the threat to fully stress an F-35," said Derek Greer, NAWCAD Integrated Battlespace Simulation and Test Department Head. "The thought was let's build a modeling and simulation environment where we can make it dense and complex to stress the F-35."

NAWCAD began developing JSE starting in 2016. As of 2023, "we just finished the operational test in September. In the process of building this high-fidelity simulator for operational test, we just so happened to create the world's best F-35 training simulator. That's why TOPGUN is here. They are here because our representation of the F-35 is really good, our representation of the threat is really, really good, and our representation of the environment, meaning the electromagnetic spectrum, is really good."

"We like to describe this as a digital range," said Blaine Summers, NAWCAD Joint Simulation Environment Director. "As opposed to our open-air, physical ranges, JSE is effectively a digital range where we can rapidly construct different threat presentations, different blue weapon systems and understand how they really hold up in full-scale global conflict. And we can do that on a digital range where we don't have to worry about loss of life or aircraft, or worry about our adversaries watching what we are up to."

"We really started positive momentum in January 2022," Greer said. "That is when the simulator sufficiently matured and we hosted our first training event which received out of this world rave reviews."

In addition to the aircraft themselves, a multitude of weapons equipped on the real-life aircraft are also being added into the JSE programming.

"We are building a foundation for next-generation weapon system integration," Summers said.

The JSE stands above other training simulators mainly due to its ability to replicate high-fidelity threat models that are provided by the intelligence community, which includes a model of an adversary aircraft and all of its sensors and weapons and can simulate ground threats. Greer said that the simulators ability to model the electromagnetic spectrum enables pilots to engage across all capabilities and challenges.

"[Pilots] are not used to flying against threats that shoot weapons," he said. "They are not used to flying against targets that detect an F-35 at ranges we would expect an F-35 to be detected at. They don't get that in flying [on a range] or in legacy simulators. We have made JSE match the intel [on our near-peer adversaries] to the best of our ability."

The JSE, with the assistance of Lockheed Martin, has the best representation of the F-35, including handling, weapon and sensor systems.

"These pilots are experts," Greer said. "If there was something wrong, or something was off, they would tell us in two seconds."

More than 500 pilots have gone through the JSE since it became operational, Greer said. Among those pilots are the elite naval aviators that have been accepted to TOPGUN and the JSE hosted a group of students and instructors in October.

When TOPGUN instructors and students are in town for training, they perform more than 350 sorties, or simulated flights, through the JSE, Summers said.

"Their instructors would typically need a year to a year and a half in other places in order to get that throughput. The quantity of reps and sets they are getting is just phenomenal and that's where the learning is happening."

Lt. Cmdr. Zach "Jerry" Williams, a member of the TOPGUN training staff and an F-35 Fleet Training Officer, said pilots who come out of the simulator are unanimously "exhausted at the end."

"F-35 pilots have never trained in the fleet. They don't often train to a threat that can find them and shoot them," Williams said. "Our adversary aircraft [used on ranges] usually don't have modern sensors equipped that can track an F-35. We also don't have enough assets to train to. So, the students leave here with wide eyes because now they see a threat that can detect them, a threat that can shoot them. They then have to defend that threat or they try. When you go through an entire day and you see the 'killed' symbol on your screen over and over and over again and then you can go up to debrief and diagnose that exact moment where you were killed—that is a perspective changing experience."

Williams said he develops tactics for the F-35 and was able to work with the JSE team to introduce a specific threat into the simulator in order to confirm if a tactic he had developed would be successful against that specific threat and scenario.

"I can take the effects that I see here and confirm all the mission planning I've done. I can't actually replicate that threat in the real world, but I now have two sources confirming the same thing. And now I can say, 'I might be able to publish a tactic against that threat.'"

Williams said before using the JSE, he would take given information from the intelligence community regarding threat capabilities and discern what could be a response tactic.

"Here, I can validate it," he said. "It's better to validate against something rather than nothing."

"What really facilitates that learning is they go execute a mission and the digital range is of such fidelity that they get punished if they make mistakes because the threats are really good, like they would be in the real world," Summers said. "They literally walk upstairs to a debriefing room two minutes after the mission and they go talk about and watch the replay."

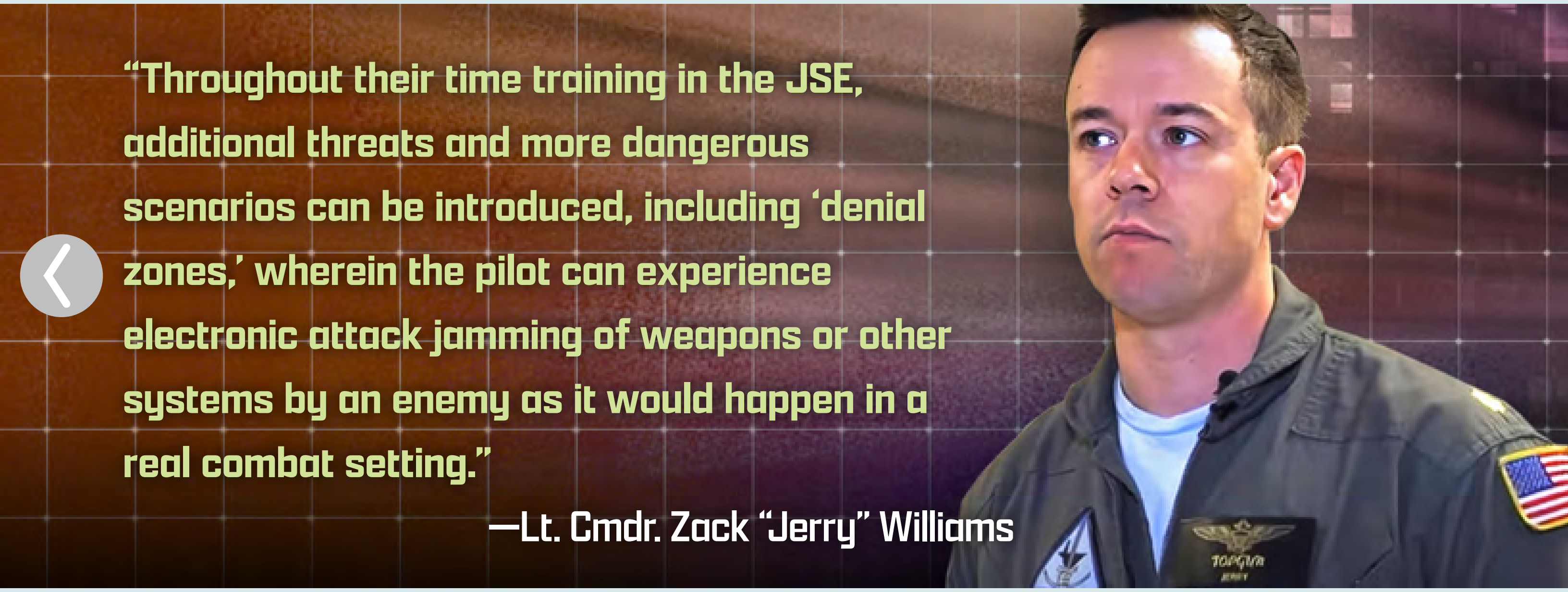
From there pilots have a chance to examine what they saw, what they did and what they could do better. After reviewing the scenario, they can go right back into the simulator and do it again.

"They wash, rinse and repeat day in and day out until they hone their tactics," he said.

Throughout their time training in the JSE, additional threats and more dangerous scenarios can be introduced, including "denial zones," wherein the pilot can experience electronic attack jamming of weapons or other systems by an enemy as it would happen in a real combat setting.

Greer said instructors have the ability to more or less "drag and drop" new scenarios in front of students in a matter of minutes while in the simulator to introduce a new threat, or increase the difficulty of the enemy. He said that the JSE enables such a diverse training environment that a group of students could fly more than 50 missions in a week and never encounter the same scenario.

"Typically, they're getting new scenarios every single run," he said. "Sometimes if


"Throughout their time training in the JSE, additional threats and more dangerous scenarios can be introduced, including 'denial zones,' wherein the pilot can experience electronic attack jamming of weapons or other systems by an enemy as it would happen in a real combat setting."

—Lt. Cmdr. Zack "Jerry" Williams

performance was particularly poor in a certain run, they can go back and run it again and try to get better, but generally they are tweaking the threat laydown and presentation run to run to present a new challenge to the pilots."

The decision to bring pilots to NAWCAD for a week of simulator training while attending TOPGUN came around as a result of the Naval Aviation Warfighting Development Center (NAWDC) at Fallon, Nevada, which is also home to TOPGUN, not having a simulator environment capable of stressing F-35 pilots to the greatest of their abilities.


U.S. Navy photos

The Joint Simulation Environment puts pilots in F-35 Lightning II cockpit "pods" and through scenarios in a simulation setting wherein they encounter enemies that can hunt them, find them and "kill" them. Due to the flexibility of the JSE, pilots can be pitted against increasingly dangerous hostiles that they would encounter in the real world.

U.S. Navy photo illustration by Fred Flerlage; imagery from U.S. Navy video & photo

"We've had to travel with the class to different concentration centers, where there are simulated environments, and those training environments are fine for basic F-35 execution, for making sure that people can operate the aircraft safely, and have a basic concept and grasp of tactics," Williams said. "But those environments fell short in training in that graduate level teaching that we're trying to do—to find mission success in a more complicated environment. And so that's why we had to come here."

For the same reasons the Navy is using the JSE for training, the Air Force is also looking to use the technology to train pilots in the F-22 Raptor platform. NAWCAD and the Air Force are currently collaborating to add the F-22 to the Air Force's own JSE, currently being built, and upgrade it to the marque standard of the JSE at NAS Patuxent River. This will allow Air Force pilots to receive the same level of training pilots are currently experiencing at the JSE. Integration is expected to be finished in early 2024.

Greer said the next step is incorporating the entire carrier air wing into JSE—F/A-18 Super Hornets and EA-18G Growler models are being integrated and the team is currently in the early phases of adding the E-2D Hawkeye platform to the simulator. The "North Star" will be when the Integrated Training Facility at Fallon—which is moving to JSE architecture—has the ability to run scenarios with pilots flying different platforms in a single scenario as if they were deployed. The ITF at Fallon is where carrier air wing pilots go to train for two months prior to deployment.

Another important aspect of the simulator is its ability to be deployed aboard aircraft carriers, where F-35 pilots will be able to maintain their edge during long times at sea in a safe environment.

"The skills required to optimally use an F-35 require regular training to keep the skills sharp," Greer said. "[Flying an F-35] is not something that you can just go do and then be deployed for six or nine months and not practice at all and then, at any given time, be able to fight a near-peer adversary. It just doesn't work that way. It's very much muscle memory and constant training to keep the skills sharp."

A smaller, "light" version of the JSE is currently deployed aboard USS Carl Vinson (CVN 70), and Greer said they are working to make it better and integrate it with other platforms in the airwing and have a JSE deployed with the USS Abraham Lincoln (CVN 72) next year.

"We've leveraged lessons learned and expertise gained in developing JSE to rapidly close the F-35 training gap for CVN-70," Summers said. "Less than six months after funding showed up, we delivered that capability to support the F-35 squadron that is currently deployed."

"The first F-35C squadron, [Strike Fighter Squadron] VFA-147, deployed two years ago and had no F-35 trainer at all. The minute that carrier pulled away from the dock, the skills of those F-35 pilots started [degrading] and gradually continued [degrading] throughout the deployment. That's really bad for us, so we're trying to do something about it," Greer said.

Rob Perry is a writer and editor for Naval Aviation News.

SHARING T

Naval Aviation Training Mitigates Risk of Bird Strikes

By Anne Owens

Naval Aviation is built on a physically and mentally rigorous syllabus that requires students and instructors to overcome many challenges. Student Naval Aviators (SNAs) are sometimes required to make split-second decisions, respond to simulated emergencies and occasionally respond to actual inflight emergencies. Some naval air stations that support SNA training are located in major migratory corridors where hundreds of migrating bird species create an additional challenge to safe flight. To address this challenge, in June 2010, Commander, Naval Installations Command, established the Bird/Animal Aircraft Strike Hazard (BASH) program.

Later that year, Chief of Naval Air Training (CNATRA) implemented the BASH program across all five of its training air wing locations. Since its inception, the BASH program has proven to be an essential tool to keep Navy SNAs and instructor pilots safe.

CNATRA has 17 squadrons that train in five different geographic locations. Each geographic area faces unique challenges in regard to bird migration patterns. As a result, each location has developed a unique BASH program made up of environmental and aviation experts. These working groups of Navy representatives partner with entities including Naval Facilities Engineering Systems Command (NAVFAC), U.S. Department of Agriculture (USDA) wildlife biologists, natural resource managers and the Smithsonian Institution Feather Identification Lab to collect and understand wildlife data that shapes daily air operations.

Training Air Wing (TW) 5 in Whiting Field, Florida, and TW-6 in Pensacola, Florida, face wildlife challenges such as Mississippi kites—low-flying birds that dive and swoop while foraging. Ryan Lynch, wildlife biologist with USDA Wildlife Services-Florida Program, said this phenomenon increases the likelihood of bird strikes with Navy training aircraft operating at low altitudes.

"Mississippi kites are present locally from April through July every year, with as many as 40 on the airfield at one time," Lynch said. "They can be managed by reducing or removing available food sources and [utilization of] non-lethal dispersal. These birds are insectivorous, and the U.S. Navy authorizes a contractor to apply approved insecticides, targeting grasshoppers and other insects. By removing a wildlife attractant (including water and food sources, as well as nesting and perching areas), we encourage kites to

A scissor-tailed flycatcher sits on the barrier fence Naval Air Station Kingsville, Texas, in November 2022. NAS Kingsville is located in the Central Flyway, a major migratory path for hundreds of species of birds.

U.S. Navy photo illustration by Fred Flerlage; imagery by Anne Owens

seek out other areas for them to fill their daily requirements."

Farther west, excessive rainfall in Corpus Christi, Texas, contributed to the growth of the cattail plant, attracting desert termites, which in turn attracted laughing gulls. These larger sea birds create hazards for pilots in the T-6B Texan II and the T-44C Pegasus that operate out of Naval Air Station (NAS) Corpus Christi.

All CNATRA bases employ landscape management—managing grass height to reduce or eliminate seed production—to prevent lower-tier prey, such as mice, from establishing habitats and attracting second-tier predators to the airfield. Other passive control measures include placing physical barriers around an airfield and anti-perching devices. Direct control measures include responsible use of pyrotechnics, propane cannons and bioacoustics to encourage species to move elsewhere. The Navy partners with USDA to trap sensitive wildlife species, such as hawks and owls, and relocate them to more appropriate habitats.

Habitat management by USDA wildlife biologists and NAVFAC natural resources managers such as Aaron Riffenbaugh attempt to decrease potentially hazardous bird activity in aircraft operations areas. He explained how direct control makes an area less suitable for invasive species.

"When it comes to wildlife, it's about caloric balancing," Riffenbaugh said. "If an animal comes into an area and is constantly being moved around the airfield, it's spending more calories than it's taking in. Fitness is reduced, reproduction is reduced, and there's fewer animals on the landscape over time when the habitat is less suitable. The animals instinctively go somewhere else."

The BASH program also helps mitigate interactions between Navy aircraft and wildlife on the ground. Flight lines and outlying fields (OLFs) experience complications associated with the presence of large mammals such as white-tailed deer and coyotes on the airfield. Preventative measures that have been applied in these cases include in-ground fencing and large slabs of concrete or rock applied along the perimeter fence to reduce access of large mammals and burrowing animals onto active airfields.

Working With the Smithsonian

When an aircraft experiences a bird strike, data is collected for analysis.

If a pilot is aware of the bird strike, it is immediately reported upon landing and squadron aviation safety officers write a hazard report for each individual strike. If the pilot does not notice the strike, it's typically discovered by maintenance personnel during post flight inspection. Maintenance personnel collect the remains and ship them to the Smithsonian Institution for DNA analysis to determine the species.

Jim Whatton is a research assistant with the Smithsonian Institution Feather Identification Lab in Washington, D.C., and is responsible for identifying wildlife involved in aircraft strikes. He then enters that information into a database that supports multiple partners.

"With over 90 percent of strikes occurring on take-off and landing, this information is key to managing habitat to prevent problematic species from being attracted to the airfield environment," Whatton said. "Not all birds on the airfield carry the same risk and knowing which species are actually getting struck allows the biologists and airfield managers to focus the resources on the problem. Having a robust strike record can also help justify changes in surrounding landscapes and allocation of resources."

After the species is identified at the lab, it is recorded into Risk Management Information (RMI), the Navy's safety mishap reporting system. USDA biologists, engineers and safety personnel can search this data to determine long-term trends and problematic species to improve aircraft design and flight tactics to mitigate wildlife risks.

According to Whatton, the information obtained from these investigations benefits partners at many levels, not just the Navy, helping to shape future operations.

"The RMI is searchable for trend analysis, so biologists can query the data over time to detect changes in species composition, monitor for effectiveness of mitigation measures and provide historical context for risk analysis," he said. "The Smithsonian's vast research collections and expertise make it a perfect place for this type of interagency collaboration. The final goal is to make the skies safer for all who fly."

BASH incidents can pose an elevated risk to single engine aircraft that routinely operate in migratory corridors with dense bird activity. NAS Kingsville, Texas, and NAS Meridian, Mississippi, are both located in prime migratory corridors, the Central Flyway and Mississippi Flyway, respectively, with bird populations at their highest in the spring and fall.

According to the National Wildlife Strike Database, 92 percent of all bird strikes occur at altitudes less than 3,000 feet above ground level (AGL), with 70 percent occurring below 500 feet AGL. Naval aviators reduce their exposure to birds at low altitudes by transiting the air space quickly whenever possible. But when pilots are required to train at low altitude, such as takeoff and landing practice, they learn to apply operational risk management (ORM) in order pursue the mission safely. For instance, SNAs must perform touch-and-go's, a maneuver in which the pilot lands and immediately takes off. To mitigate the risk of bird strikes during events like these, CNATRA requires that a daily risk assessment be conducted to determine if the BASH conditions are conducive to executing daily training events.

Avian Radar

TW-2 has utilized an avian radar since 2012, building a vast collection of data that has helped them operate in an area of high

Photo courtesy of the Smithsonian Feather Identification Lab, Division of Birds, National Museum of Natural History

When a bird strike occurs, data is collected for analysis. The Smithsonian Institution Feather Identification Lab in Washington, D.C., processes samples to identify wildlife involved in aircraft strikes. The information obtained from these investigations benefits partners at many levels, not just the Navy, helping to shape future operations.

U.S. Navy photo by Anne Owens

Eddie Earwood, a USDA Wildlife Biologist with NAS Kingsville, stands in front of an avian radar utilized by Training Air Wing 2 (TW-2) to detect and predict paths of bird movement and migration patterns.

bird migration. For years, the system in place was a 2D radar with rotating vertical and horizontal array radars, displaying distance to the target, direction of the target and on the vertical radar the angle of the target, allowing for altitude calculations for targets within the approach and departure corridors. This provided a substantial amount of data but did not provide altitude information for targets within the 360-degree, four-nautical-mile radius of the airfield. Recently, NAS Kingsville acquired a cutting-edge bird strike avoidance radar system with four 3D panel radars, providing 3D information on the targets, including altitude information for all targets within a 4-nautical-mile radius of the airfield.

This system is equipped with an Electro-Optical/Infra-Red (EO/IR) camera, providing a visual and thermal image during night or day operations. When the radar operator needs to visually identify a target that has been detected, the camera pans, tilts and zooms to the target using the 3D coordinates provided by the four radars. This system uses the existing 2D horizontal scanning radar and extends the monitored range from 4 nautical miles to 8 nautical miles to include as much critical airspace in NAS Kingsville's initial corridor as possible with the intention of seeing large groups of large birds far from the airfield sooner.

"The BASH program is a vital resource to the instructors and student pilots at Training Air Wing 2," said TW-2 Commodore Capt. Aaron Rybar. "NAS Kingsville's recent implementation of a 3D avian radar will go far to mitigate future bird strikes by utilizing data-driven insights that help keep our pilots and communities safe while modernizing our approach to this problem. The technology in use here in Kingsville allows our talented team to ensure our policies and procedures minimize the avian risk during known periods of high bird migration. The coupling of technology with real-time risk assessment along with data analytics of local avian levels has resulted in safer flight operations, while also increasing sortie completion rates, a true win-win for both the community and the wing."

BASH Reporting

Eddie Earwood, NAS Kingsville's resident USDA wildlife biologist, made BASH reporting an essential function in Kingsville since 2006, and the avian radar has been instrumental in fostering a safer flight environment for naval aviators and wildlife.

"One of my main responsibilities was to start pumping data from the radar," Earwood said. "It starts with reporting; if you don't have strike reporting you can't even begin. Prior to 2005, there was very limited BASH reporting, so there was no historical data to compare. Policies changed that leveraged maintenance [personnel] contracts to insure strikes were documented, allowing Wing Safety personnel to then report strikes. We were able to turn reporting up to a very high level."

Earwood said he was initially surprised by the radar data, which showed a vast increase in bird activity at night, when it was previously believed that bird activity was at its highest just after sunrise and just before sunset. Despite occasional bird strikes that occur throughout CNATRA units, Earwood is confident that overall populations of commonly struck species are not impacted and, for certain species, populations appear to be significantly increasing.

As fall migration approaches, lasting from early August through October, Earwood said he expects to see an even more accurate collection of data that will help determine the safest corresponding corridor for flight operations to continue.

Wildlife Detection and Dispersal Team

Earwood developed a training requirement through Commander, Navy Installations Command (CNIC) to create the Wildlife Detection and Dispersal Team (WDDT). The WDDT is a rapid response team tasked with patrolling the airfield


The avian radar in use at NAS Kingsville .

U.S. Navy photo by Anne Owens

perimeter fence during flight operations, ready to perform direct control duties to keep the airfield clear. This responsibility is carried out by field support personnel, who are trained to perform wildlife abatement on the airfield.

"If the wing duty officer (WDO) sees something concerning on the avian radar, or a pilot reports a large group of birds, they can call the WDDT to respond to that threat and report back to the tower," Earwood said. "During periods of migration, we increase the requirement for perimeter patrol. We look for large groups of birds coming from the north moving south for the winter. We need to get our eyes on them before they enter our critical airspace."

Earwood said birds naturally maneuver to avoid aircraft, but sometimes their instincts increase the risk of contact.

"Birds typically depend on gravity to accelerate and avoid," Earwood said. "When they are above an aircraft and detect that threat, they tuck their wings to descend as quickly as possible, causing them to fall directly into the aircraft."

Policy Changes

While monitoring real-time information from the avian radar, and gathering inputs from airborne pilots and the WDDT team on the ground, the WDO is responsible for setting daily BASH conditions. The Navy's new BASH policy outlines low, moderate, high and severe levels of avian radar target counts. This allows for greater understanding of changing bird activity during training.

Cmdr. Peter Curran, from Weaverville, California, has been a pilot since 2001 and flew the EA-6B Prowler and EA-18G Growler. He currently oversees the TW-2 Safety Office in Kingsville.

"BASH is near and dear to our hearts in Kingsville since we are in this migration zone with single-engine aircraft, fighting this battle every day," Curran said. "Our landing pattern operates at 600 feet above ground level (AGL), which is where a vast majority of strikes occur, and we have developed one of the most comprehensive BASH programs to mitigate risk."

This new BASH policy, implemented in April 2022, was driven by the research of Scott Simpson, a former TW-2 instructor pilot who wanted to balance safety with training requirements by efficiently planning flight operations around BASH conditions.

Simpson, from Southlake, Texas, graduated from the Naval Academy with a degree in mechanical engineering and then earned his Master of Business Administration and master's degree from Georgia Tech in aerospace engineering. During his time in the Navy, Simpson flew the F/A-18 Hornet and the T-45 Goshawk as an instructor pilot at TW-2. He has since separated from the Navy and currently works for Boston Consulting Group.

"I worked in operations during my four years in Kingsville, and I knew how much bird strike mitigation affected us on the operations side," Simpson said. "Two times a year, there are a ton of birds migrating right through Kingsville and the degree of concentration is higher in our location than in others, making our objective risk higher… I wanted to use a data-driven approach to apply a more coherent, efficient risk policy that increases safety while also increasing operational tempo, so that ended up being my goal."

While the avian radar enables NAS Kingsville to more accurately set BASH conditions, clear, measurable and historical data needed to be captured to make policy changes. Simpson's research into data collected by the avian radar showed that Naval Aviators face the most danger of a bird strike flying low altitude at high speeds for long periods of time. As bird count increases, pilots need to spend less time in those critical areas low to the ground.

"We introduced a new profile with a very steep climb out at a slower speed, with the intention of getting above that danger zone as quickly as possible and reducing the energy of impact should a strike occur," Curran said. "Using simulators, we performed mitigated departures at different air speeds to determine if we have enough energy available to land safely. With this updated policy with a steeper climb, our pilots are in a better energy profile to return for an arrested landing in case of bird strike."

Prior to Simpson's research, BASH conditions were set by the WDO and pilots could spend three-to-four minutes waiting below 3,000 feet AGL in dangerous airspace for wingmen to take off and join them, increasing risk of bird strike with every moment.

"This theory helped us build a new departure profile that is currently being used to reduce risk when we launch airplanes," Simpson said. "We did have a reduced risk recovery profile already in place, but the profile didn't exist for departures. By implementing a new profile for launching aircraft, the probability of a bird strike is reduced. In the worst case scenario of a bird strike going down the engine, this new profile gives the pilot the ability to return to the airfield for a safe landing."

Simpson hopes his research creates a safer environment for Naval Aviators at TW-2 and further benefits other units throughout the Naval Air Training Command (NATRACOM) enterprise.

"Ultimately, I hope that my research saves lives and saves aircraft," Simpson said. "I'd love to hear someday that a pilot made it back to the field on a reduced-risk departure profile that they wouldn't have otherwise. I also hope these policies expand beyond Kingsville throughout the NATRACOM and that all of Naval Aviation can benefit from the practices we've implemented in Kingsville."

Even with only a few months of data collected since updated BASH policies went into effect, the trends have been distinctly positive. From January to August 2022, TW-2 has 14 less bird strikes than in 2021 in the same time span. While the safety of CNATRA's Naval Aviators will always remain a top priority, ultimately, even when bird strike risk is low, it's never zero.

Anne Owens is a deputy public affairs officer for CNATRA at NAS Corpus Christi, Texas.

A Quick Reaction to a Bird Strike

CNATRA's thorough emergency response training prepares pilots for a range of high-risk possibilities, but study and simulation can never completely duplicate all of the factors presented in an actual in-flight emergency.

Cmdr. Cody Dowd, from Bartlesville, Oklahoma, has been a pilot since 2006 and has flown with fleet squadrons operating the C-2A Greyhound. He has spent close to nine years of his Navy career flying in and around Kingsville.

In September 2022, Dowd was in a formation flight on short final approach when he saw a large bird on the right side of his plane disappear below the glareshield and impact the aircraft.

"Based on the trajectory, it had a decent chance to have gone down my right intake," Dowd said. "Upon impact, I immediately thought about where I was in time and space, what configuration the jet was in, what the health of my engine was, and how to maneuver the jet to get into a better profile to maximize my time in a more effective ejection envelope as well as ensuring that we had enough energy on the jet to land it on the runway."

Photo courtesy of Cmdr. Dowd

Cmdr. Cody Dowd poses in front of a T-45 Goshawk.

He quickly took controls and nosed the plane over to intercept a steeper landing profile. On the landing, Dowd noted that engine readings were nominal, and the landing was uneventful. Blood spatter was found in the starboard wheel well between the intake and the landing gear. It was determined that no damage had occurred to the aircraft.

"BASH is something that all Kingsville pilots, IPs and students, take seriously," Dowd said. "With the use of our radar, and with the implementation of our new TW-2 BASH mitigation policies, I think we have done as much as we can to mitigate the risks of sharing these skies with our feathered avian friends."

Training Air Wing 2 Tests Out IFLOLS at JRB Fort Worth

By Sandy Owens

In an effort to avoid the seasonal bird migrations at its home station in Kingsville, Texas, Training Air Wing 2 (TW-2) established a detachment training site at Naval Air Station (NAS) Joint Reserve Base (JRB) Fort Worth, Texas, Sept. 5-21. Fort Worth also offered the opportunity for the wing to use the base's newly acquired Improved Fresnel Lens Optical Landing System (IFLOLS).

U.S. Navy photo by Carl Richards

A T-45 aircraft sits on the flightline at NAS JRB Fort Worth, Texas, during TW-2 detachment training.

Bird migration often disrupts training opportunities in Kingsville.

"We are testing out Fort Worth as a detachment base, to see if it can be used for our training during the Fall and Spring due to heavy bird migrations in Kingsville," said Lt. Joseph Jackson, an instructor pilot with TW-2. "The influx of birds becomes such a challenge that we are often unable to fly. Our hope is to mitigate the disruption caused by the birds by supplementing our operations with flights here."

TW-2's mission is to prepare jet pipeline Student Naval Aviators for subsequent operational and combat instruction. The T-45C aircraft is used to teach basic tactics such as weapons delivery, close formation flying, air combat maneuvering and carrier qualification.

"The detachment has been going really well, we have not had any issues. Working with the Air Force and Marines within the air space has been really smooth," Jackson said. "Our focus right now is fundamental training activities, including takeoffs, landings, aerobatics and formation flying. A big focus is Field Carrier Landing Practice, which is critical for us getting ready to go to the aircraft carrier. In order for us to practice this we have to have the IFLOLS, which there are very few that exist in the Navy, so it's a big deal that NAS JRB Fort Worth has one."

The training included 40 student jet pilots, 20 instructor pilots and 10 T-45C Goshawk aircraft.

During a visit to NAS JRB Fort Worth on Sept. 18, Chief of Naval Air Training Rear Adm. Richard Brophy emphasized the importance of the IFLOLS in the training of jet naval aviators.

"IFLOLS is a critical system that is essential for every tailhook naval aviator to master. The availability of a shore based system at NAS JRB Fort Worth provides our training air wings with an opportunity to pursue elevated training for Student Naval Aviators prior to their initial qualification at sea," Brophy said. "NAS JRB Fort Worth is an ideal location that offers flexibility and reduced risk from bird strike. We are looking forward to the training progress that we will complete here in the coming weeks."

Coordinating the detachment from NAS JRB Fort Worth was Lt. Cmdr. William Husky, Operations Officer. As a result of this training detachment, Air Traffic Controllers on the installation were able to obtain qualification hours and Transient Line personnel were given hands-on experience setting up the IFLOLS.

"Hosting TW-2 has been a great opportunity for Air Traffic Controllers and Transient Line personnel to receive training. Our Air Traffic Controllers have been able to accumulate qualification hours, and our Transient Line personnel have been able to refine their skills in setting up the IFLOLS," Husky said. "This experience is contributing to their future success in supporting aviation operations here on the installation and beyond."

Sandy Owens is a deputy public affairs officer at Naval Air Station Joint Reserve Base Fort Worth, Texas.

U.S. Navy photo by Carl Richards

A T-45 out of Naval Air Station Kingsville,Texas, tests the Improved Fresnel Lens Optical Landing System (IFLOLS) at NAS Joint Reserve Base Fort Worth, Texas.

About the Improved Fresnel Lens Optical Landing System (IFLOLS)

Naval Air Station (NAS) Joint Reserve Base (JRB) Fort Worth recently expanded its training capabilities by acquiring an Improved Fresnel Lens Optical Landing System (IFLOLS). With this specialized equipment, NAS JRB Fort Worth is now fully equipped to host specialized training flights for pilots, enabling them to practice and perfect their aircraft carrier landing skills.

"The IFLOLS, or 'meatball,' will be invaluable for student naval aviators learning to land on aircraft carriers," said Executive Officer Clayton Johnson. "The aircraft carrier environment is unique among runways since it is just 500 feet long, located 60 feet above a pitching sea with minimal lighting at night. The meatball is a key component to getting a naval aviator on deck safely at the carrier. It requires special experience to use it properly, and the consequences of ignoring it or misinterpreting its signals can easily result in catastrophic mishaps."

The IFLOLS allows new pilots to undergo training in a controlled environment. Aspiring naval aviators will undergo Field Carrier Landing Practice (FLCP) flights, both during the day and night, to master utilization of the IFLOLS under simulated carrier conditions.

"FCLP flights consist of up to a dozen touch-and-go landings per student, each of which will be carefully graded by an experienced Landing Signals Officer (LSO). The LSO is a seasoned carrier aviator specifically trained to mentor and guide pilots as they land at the carrier," Johnson said.

The installation and removal of the IFLOLS on the flight line will be handled by the transient line personnel at NAS JRB Fort Worth. Ground electronics technicians will be responsible for conducting maintenance to ensure the IFLOLS remains in optimal working condition.

"We proactively sent two Sailors from the transient line and one from ground electronics to NAS Meridian for training on the pre-operational inspection and proper setup of an IFLOLS," said Aircraft Launch and Recovery Equipment Maintenance Subject Matter Expert Rob Donaldson. "This training ensures that personnel are equipped with the necessary skills to efficiently perform these tasks and maintain the IFLOLS system at its peak operational capabilities. The setup process itself typically takes around 45 minutes to complete."

The IFLOLS is unique to the Navy as no other service routinely operates aircraft offshore, hundreds of miles away from land.

"In one sense, it is the IFLOLS—in conjunction with tailhooks and arresting cables—that allows our Navy to project power around the world. I'm proud that NAS JRB Fort Worth gets to be part of the story for those young student pilots learning how to land at 'the boat,'" Johnson said.

—Sandy Owens

Ergonomics Enables Longer Sorties, Improves Aircraft Habitability

By Jacquelyn Tolbert-Millham

E-2D Advanced Hawkeye pilot, copilot, and three navigational flight officers (NFO) may soon be able to endure longer flights, across greater distances and in greater comfort due, in part, to a recently developed ergonomically-designed seating system initially funded by the Naval Air Systems Command's (NAVAIR) Small Business Innovation Research (SBIR) Program.

MAVRIC allowed VX-20 E-2 Project Officer and NFO Lt. Nicholas "Reek" Jahrmarkt to pull closer to the aircraft's instrumentation than he could sitting in the legacy seat.

The technology is called the Multi-Axis Vibration Reduction Increased Comfort (MAVRIC) seats, designed by small business partner Safe, Inc. It reduces the impact of the E-2D's three-axis, whole-body vibration, as well as improves its seating ergonomics. The need for this solution became critical following the Hawkeye's aerial flight refueling system installation, which extended the length of its sorties to 6 to 8 hours according to the project's technical point of contact William Glass, a Naval Air Warfare Center Aircraft Division (NAWCAD) Senior Engineer and NAVAIR Associate Fellow, working out of the NAWCAD Human Systems Engineering Department's Crashworthy and Escape Systems Branch.

"Ergonomics, the applied science of equipment design intended to maximize productivity by reducing operator fatigue and discomfort, is just as essential to warfighter performance as training or experience," he said. "The MAVRIC seat effort was initiated to provide the pilots and aircrew of the E-2D with a seating system that addressed deficiencies with the previous seat, and to provide a platform that greatly enhances their ability to conduct extended duration missions without suffering from physical pains or discomforts."

MAVRIC for E-2Ds required two different designs, one for pilots and another for cabin crew. Both reduce vibration input along all three axes and recline without lifting the occupant's feet from the floor. This ergonomic design enables users to adjust the seat into a comfortable position during extended flights. The cabin seat for the NFOs features a lever that rotates the seat 90 degrees so that they are facing forward during launch and recovery and can move the seat for optimal equipment reach during operations. The seat also includes thicker, topographical contoured cushions covered with a breathable cover ergonomically designed to provide improved support to users' thighs to alleviate pressure points

U.S. Navy photo by Rob Perry


U.S. Navy photo by Rob Perry

Bob Gansman, director of technology development for Safe, Inc., and VX-20 E-2 Project Officer and NFO Lt. Nicholas "Reek" Jahrmarkt install the "feet" on MAVRIC.

at the hips and under the pelvis during long missions.

One feature, commonly referred to as "the lift," is game changing, according to pilots and aircrew.

"A clever mechanism at the rear of the seat, which can be adjusted for any occupant's weight, carries the PSE mass on the seat rather than the occupant. That means the E-2D's occupants no longer have to bear all of that weight for hours at a time," Glass said.

The pilot seat was installed in an Air Test Evaluation Squadron (VX) 1 E-2D aircraft. Operational Test Director Lt. Cmdr. Hunter "Sheriff" Fahey flew the aircraft during a prototype flight test.

"I was also the project officer for MAVRIC when I was at VX-20. It's coming at an absolute opportune time as the E-2D missions are beginning to be extended," he said. "The current results of testing are showing significant benefits to aircrew both physically and mentally after a four-hour mission in the MAVRIC seat."

"The design and continued development of this piece of equipment are driven heavily by the input from E-2 aircrews," said Lt. Chad "Angus" Milam, aerospace and operational physiologist/aeromedical safety officer (AMSO) at Airborne Command Control Logistics Wing Detachment Norfolk, Virginia, where MAVRIC was tested in the fleet. His primary responsibility as the aeromedical safety officer is to advocate for aircrew and ensure that the MAVRIC seat meets their operational needs while and effectively addressing the aeromedical safety concerns identified during the assessment of the current E-2 seating.

"I act as an intermediary between various agencies, both civilian and military, communicating the fleet's requirements, reporting on the progress of the program to stakeholders and providing aeromedical guidance as needed. We want our aircrews to express a sense of ownership in the development of MAVRIC and

Bob Gansman, director of technology development for Safe, Inc., and VX-20 E-2 Project Officer and NFO Lt. Nicholas "Reek" Jahrmarkt prepare MAVRIC's feet before installing in the aircraft.

U.S. Navy photo by Rob Perry

U.S. Navy photo

to make every effort, when available, to see, experience and provide feedback on the seat now so that we can incorporate today's knowledge and technology to reduce headaches and backaches caused by yesterday's design," Milam said.

Fahey said Navy Acquisition is listening to the needs and concerns of the fleet as exemplified in the development of MAVRIC. "There's been a significant amount of data collected and several ideas presented—remember the seat currently is a prototype and there's room for improvement—but we've made incredible progress in the overall aircrew accommodation and comfort."

MAVRIC represents a keystone effort in the development and procurement of a

U.S. Navy photos by Rob Perry

MAVRIC allowed VX-20 E-2 Project Officer and NFO Lt. Nicholas "Reek" Jahrmarkt to pull closer to the aircraft's instrumentation than he could sitting in the legacy seat.

The seat for the aircrew features a lever that adjusts the seat 90 degrees so that they are facing forward during launch and can move the seat to turn to their equipment during operations.

revitalized aircrew station and equipment ensemble, according to Milam.

"As we pursue this program, we must harness the momentum to tackle other critical needs of E-2 aircrew members, such as a modernized parachute and harness," he said.

Capturing NFO feedback is key to MAVRIC's ergonomic design, according to Bob Gansman, director of technology development for Safe, Inc. and one of the seat's developers.

"Companies follow the equipment specifications written by the military but it is a challenge to convey all of the nuances of what aircrew need to best support their mission," he said. "You don't know for sure until it is put into the aircraft. This is why we installed the prototypes at VX-1 and V-20 where it was tested by the users. We can ensure it does what it's designed to do and it's an opportunity for us to learn firsthand what they need and want."

VX-20 E-2 Project Officer and NFO Lt. Nicholas "Reek" Jahrmarkt, who also tested MAVRIC, was impressed with the simplicity of the design.

"When we test a prototype like MAVRIC, we have to think of it in the [aircraft] carrier environment and how it will be used in flight," he said. "For example, the levers on the seat were moved to allow for better leg movement. Also, the locking mechanism for the parachute lever was placed on the outside rather than on the inside to prevent [users] from pulling the wrong tab."

Sometimes, Gansman said, specific

requirements must be modified when the prototype equipment is installed at point of use. For example, the round of testing at VX-20 identified a need for a protective cover for the lift adjustment mechanism button. The company is also looking to reduce the number of parts used in the seat overall based on maintenance concerns.

Human subject testing with MAVRIC has been completed at the Air Force Research Laboratory on a human-rated vibration table, which simulates aircraft vibrations, at Wright-Patterson Air Force Base, Ohio. Tests also included ground evaluations of the pilot seat were conducted at Naval Air Station (NAS) Point Mugu, California; and more than 55 hours of fight demonstration testing of the cockpit seat was successfully completed with 13 pilots at NAS Patuxent River, Maryland.

Glass said that empirical data from this testing show a considerable reduction in aircraft vibration transmitted through the seats. Pilots are now able to remain seated for extended periods of time without experiencing pain commonly felt in the neck, back and down through the legs. They can also achieve a comfort position known as "max relax" without experiencing reduced blood flow to the back of the upper legs—all with improved functional reach.

"Aircrew testing MAVRIC noted less fatigue and musculoskeletal pain as well as a sense of better personal well-being. The effort to bring the same level of relief to the aircrew is also well underway. NAVAIR intends to conduct flight demonstration of the cabin seat version of the MAVRIC sometime in the first quarter of the 2024 fiscal year," Glass said.

Some of the MAVRIC's benefits were buoyed by efforts to mitigate vibration on other platforms. H-60 gunners also complained of prolonged exposure to aircraft vibration as a source of fatigue and discomfort. With funding from the Rapid Innovation Fund (RIF), H-60S transitioned to an in-seat vibration system, similar to the one built into the MAVRIC seating system, to reduce the impact of the aircraft's vibration along the vertical axis. RIF is a technology transition program administered by the Under Secretary of Defense for Research and Engineering Small Business and Technology Partnerships that facilitates the rapid insertion of innovative technologies into military systems or programs that meet specific defense requirements. It provides up to $3 million for development of the technology over a two-year period.

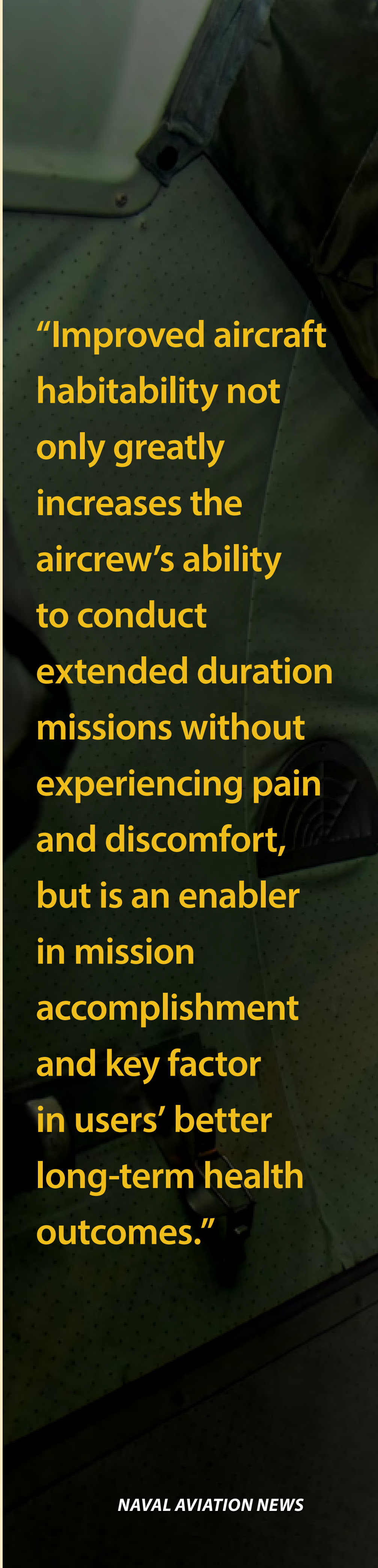
"The H-60 effort is extremely noteworthy in that it demonstrated military usefulness and robustness could be designed into an in-seat vibration isolation system," Glass said. MAVRIC will also undergo testing for static load and dynamic load (simulated crash load testing), environmental conditional and service life characterization (endurance) testing.

Safe, Inc. is continuing its work on applying ergonomics to mitigate the effects of vibration on aircrews. In addition to MAVRIC, the small business is developing a passive anti-resonance vibration isolator system, which isolates an entire helicopter crew seat at its floor attachments, as well as innovative seat restraints for troops aboard rotorcraft. Safe, Inc. is also developing the Crash Safety Data Recorder, a device that can measure and record rotorcraft crash dynamics to improve design standards for crash protection technology such as seats and restraints.

Glass said MAVRIC seating system has exceeded the original intent of the call for proposals.

"Pilot feedback has been unambiguous and it's clear that MAVRIC has greatly improved performance in the number of areas. It goes beyond addressing vibration—a top concern among aircrew," he said. "Improved aircraft habitability not only greatly increases the aircrew's ability to conduct extended duration missions without experiencing pain and discomfort, but is an enabler in mission accomplishment and key factor in users' better long-term health outcomes."

Jaquelyn Tolbert-Millham is a member of the NAVAIR Small Business Innovation Research (SBIR)/Small Business Technology Transfer (STTR) Program Public Affairs Team.



U.S. Navy photos by Rob Perry


EMERGENCY EXIT

TRICKING THE BRAIN TO PROVIDE NAVAL PILOTS WITH HIGH-TECH SPATIAL DISORIENTATION TRAINING

By Victoria Falcón

The human body is incredibly complex and amazing. For instance, consider the small, semi-circular canals just behind and below the ears that make up the vestibular system (VS). Those canals, and the fluid in them, keep humans upright and balanced when walking, running, driving and flying.

But there are many triggers that can "trick" the VS into sending false signals to the brain detecting movement when there isn't any:

- ***Drinking alcohol*** can thin the fluid in the VS canals, making the drinker unsteady and more likely to fall down;
- ***Inner ear infections*** can cause disorientation and vertigo—even nausea or tinnitus;
- ***Some medications*** can affect vestibular imbalance and cause spatial disorientation (SD).

In fact, SD is the leading cause of Class A mishaps in Naval Aviation. Though SD is caused by many factors, including visual (flying "blind" through clouds or at night) and cognitive elements, the vestibular system is an important piece of SD that Navy pilots can understand and for which they can prepare.

A team from Naval Air Warfare Center Aircraft Division (NAWCAD) at Naval Air Station Patuxent River, Maryland, and Naval Air Warfare Center Training Systems Division (NAWCTSD), Orlando, Florida, is currently developing a new method to aid in that preparation by using a stimulation tool to send signals to the VS, which then provides false input to the brain.

U.S. Navy Photo

A test subject wears a Galvanic Vestibular Stimulation (GVS) devise, as well as additional accelerometers and sensors to detect body sway and motion that is induced from the input from GVS. The subject is disoriented and trying to maintain balance while taking steps.

The team is led by Lt. Cmdr. Amanda Lippert, a U.S. Naval Aerospace and Operational Physiologist and the Aeromedical Safety Officer (AMSO) for Naval Test Wing Atlantic. AMSOs are responsible for anything non-clinical that involves the human body in the flight/operational environment. AMSOs are also responsible for pilot safety and survival training.

Lippert's team is developing a method to use Galvanic Vestibular Stimulation (GVS) to send signals to the brain during land-based training, allowing pilots to practice emergency procedures while disoriented.

"GVS can mimic how SD feels and allow pilots to practice their emergency training in an immersion-based simulation," she said.

GVS is an electronic headband that would be worn during training to send small electrical impulses to the VS. Specific pulses cause sensations of banking left or right and can also simulate a long bank or false roll.

"Our pilots used to use a Multi-station Disorientation Demonstrator (MSDD)," Lippert said.

The MSDD is antiquated technology that has been inoperable for several years. It resembles a carnival ride where pilots would enter an enclosed capsule that would spin while the MSDD base would also ro-

U.S. Navy photo illustration by Fred Flerlage; imagery by Adam Skoczylas

U.S. Navy Photo

The Multi-Station Disorientation Demonstrator (MSDD) was used to provide aircrew the only motion-based disorientation training in the Navy and Marine Corps. The MSDD was originally installed in 1980 but has been inoperable for several years.

tate at different rates. There is also a visual component to the MSDD, in that moving objects are projected on the round screen that is viewable from the capsule. The demonstrator, affectionately called the "spin and puke," created spatial disorientation accurately, but didn't have a way to simulate emergency training, and is a one-time training event that initial flight students would experience prior to flying in Naval Aviation. Now, without even this outdated device, pilots are only receiving classroom briefings for the mandatory training.

"GVS will give us a practical and safe method of delivering improved training with a hands-on approach," Lippert said. "And no one pukes with GVS—if they start feeling sick, we turn it off."

"GVS has been around for a long time—mainly in the research realm," she said. "We're just trying to bring it into the training environment."

GVS has been used by NASA and is already approved for risk considerations for a variety of research topics.

According to Lippert the first step in producing the training is easy and low-cost. AMSO's would take the headband device to a flight simulator and run the tests during pilot training. A future, more robust trainer would involve integrating GVS into Virtual Reality goggles for a high fidelity training device. In either case, GVS provides vestibular input that can be coupled with a visual input, to create a sensory mismatch and replicate a variety of illusions experienced in the flight environment.

According to Lippert, there are already proposals for developing training curriculum.

"The Navy wants GVS, but acquisition takes time," Lippert said. The GVS project was recently proposed for Naval Air Systems Command's FY24 Naval Innovative Science & Engineering (NISE) funding. The process was competitive, and the GVS project was selected for funding. The Basic & Applied Training & Technologies for Learning & Evaluation (BATTLE) Lab, at NAWCTSD, is now purchasing a GVS device for their lab, and building the plan to develop training profiles for their FY24 project. Lippert is spearheading the collaborative efforts between the BATTLE Lab and GVS experts at NASA and Colorado University.

The GVS team from NAWCAD and NAWCTSD was recently recognized at the U.S. Naval Aeromedical Conference (USNAC) with two awards for their efforts with Galvanic Vestibular Stimulation as a training device for spatial disorientation in Naval Aviation. The team received the USNAC 2023 Theoretical Research Award and the USNAC 2023 Original Research Award.

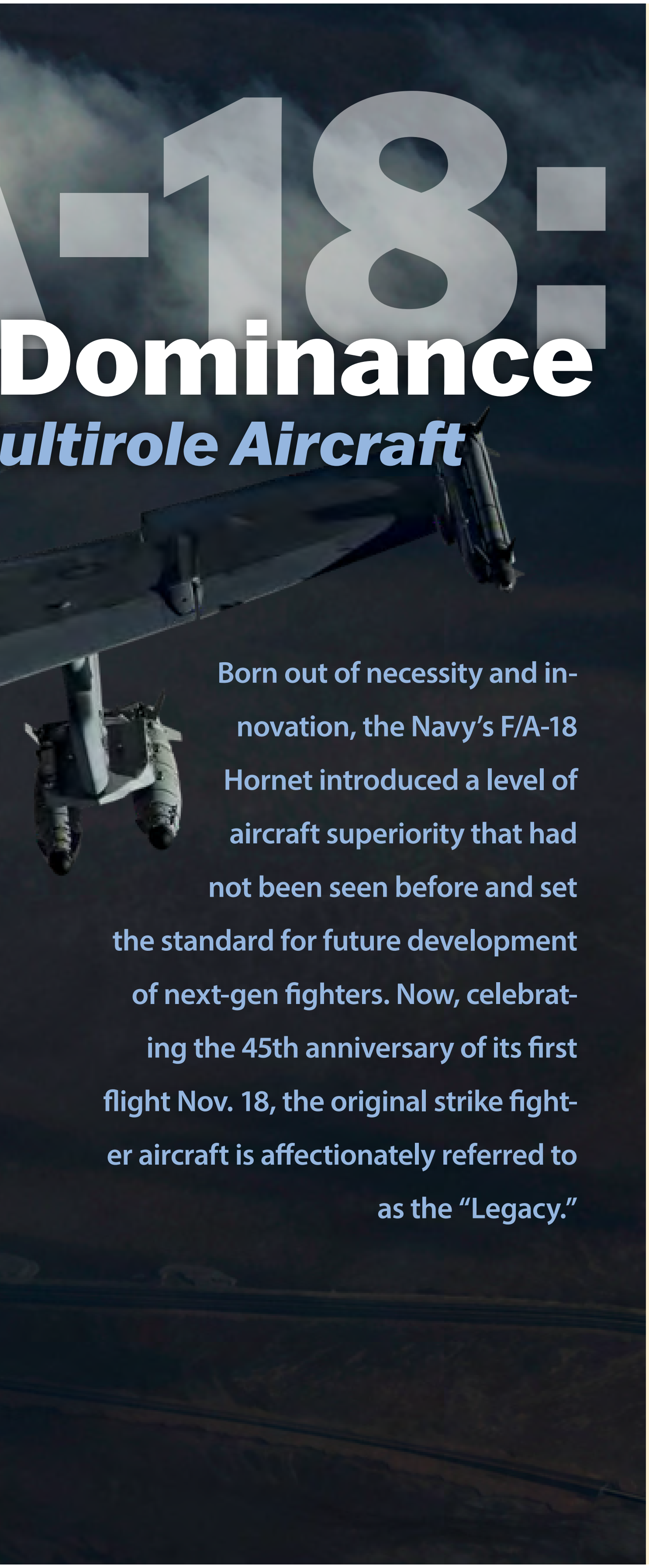
Victoria Falcón is a strategic communications specialist with Naval Test Wing Atlantic.

THE F/A
A New Generation of Air
Celebrating 45 Years of the Navy's First M

By Kaitlin Wicker

U.S. Air Force photo by Staff Sgt. Daniel Snider

A Marine Corps F/A-18 Hornet assigned to Marine Fighter Attack Squadron (VMFA) 251 flies above the U.S. Central Command area of responsibility, Jan. 17, 2020. F/A-18s can be configured quickly to perform either fighter or attack roles through use of external equipment to accomplish specific missions. This capability gives operational commanders more flexibility in employing tactical aircraft in a rapidly changing battle scenario.



A-18: Dominance

ultirole Aircraft

Born out of necessity and innovation, the Navy's F/A-18 Hornet introduced a level of aircraft superiority that had not been seen before and set the standard for future development of next-gen fighters. Now, celebrating the 45th anniversary of its first flight Nov. 18, the original strike fighter aircraft is affectionately referred to as the "Legacy."

Appropriately coined, the nickname encapsulates not only the cutting-edge capabilities of the aircraft at the time, but its place in history as the first in its class that would pave the way for future aircraft platforms.

Before the creation of the Legacy Hornet, the Navy's fighter air wing consisted of multiple aircraft, each with a specific skill set and mission. The arrival of the F/A-18 Hornet ushered in a generation of carrier-capable, multirole fighter aircraft that were all-weather and attack, designed for traditional strike applications and close air support without compromising fighter capabilities.

"It showed a great understanding of what a strike fighter mission requires," said Cmdr. Tim Tuschinski, Integrated Product Team Lead for Radar/Fighter Electronic Warfare in the F/A-18 and EA-18G Program Office. "It allowed pilots to move quickly and efficiently between the air-to-air combat mission and the air-to-ground mission; it's the flip of a switch."

The Hornet cut its teeth during Operation Desert Storm, proving its lethality and versatility. Pilots could engage adversary fighters in the air and take out ground targets during the same mission. The aircraft's survivability and easy repair only proved to further solidify its role as the preeminent aircraft in the carrier fighter air wing.

This aircraft was born at Naval Air Systems Command (NAVAIR) and developed to be a strike fighter.

"It's fast. When you slick this thing up, it flies like a bat out of hell," Tuschinski said. "It paved the way for the multi-mission platform aircraft that we see with the Super Hornet, the F-35 [Lightning II] and the next generation fighters."

Originally created by McDonnell Douglas and Northrop Grumman, the versatility of the aircraft came from its avionics, cockpit displays, excellent aerodynamics and its capability to carry a variety of weapons. It was built for pilot interface with a hands-on throttle and stick incorporation, as well as a digital cockpit.

"The most rewarding missions were the ones when we were able to locate and neutralize high value assets to keep our guys on the ground safe," said Tuschinski when reflecting on his time in the cockpit.

Today, the Legacy Hornet is no longer the preeminent strike fighter in the carrier air wing; that role has been passed along to its offspring, the Super Hornet. The Navy retired its last remaining legacy aircraft in Spring 2023. However, the Hornet remains a workhorse for the Marine Corps and the militaries of several allied nations.

"We're poised to continue sustaining this platform, keeping it lethal and survivable until its sundown," Tuschinski said. "It's going to continue its mission for the Marine Corps."

Tuschinski flew the Legacy Hornet for 15 years and supported missions in Iraq during Operation Iraqi Freedom. His squadron provided close air support for troops under fire and completed pre-strike missions to set up ground troops for success. He now works in the program office, leading the team focused on radar and electronic weapons for the F/A-18 and the EA-18G.

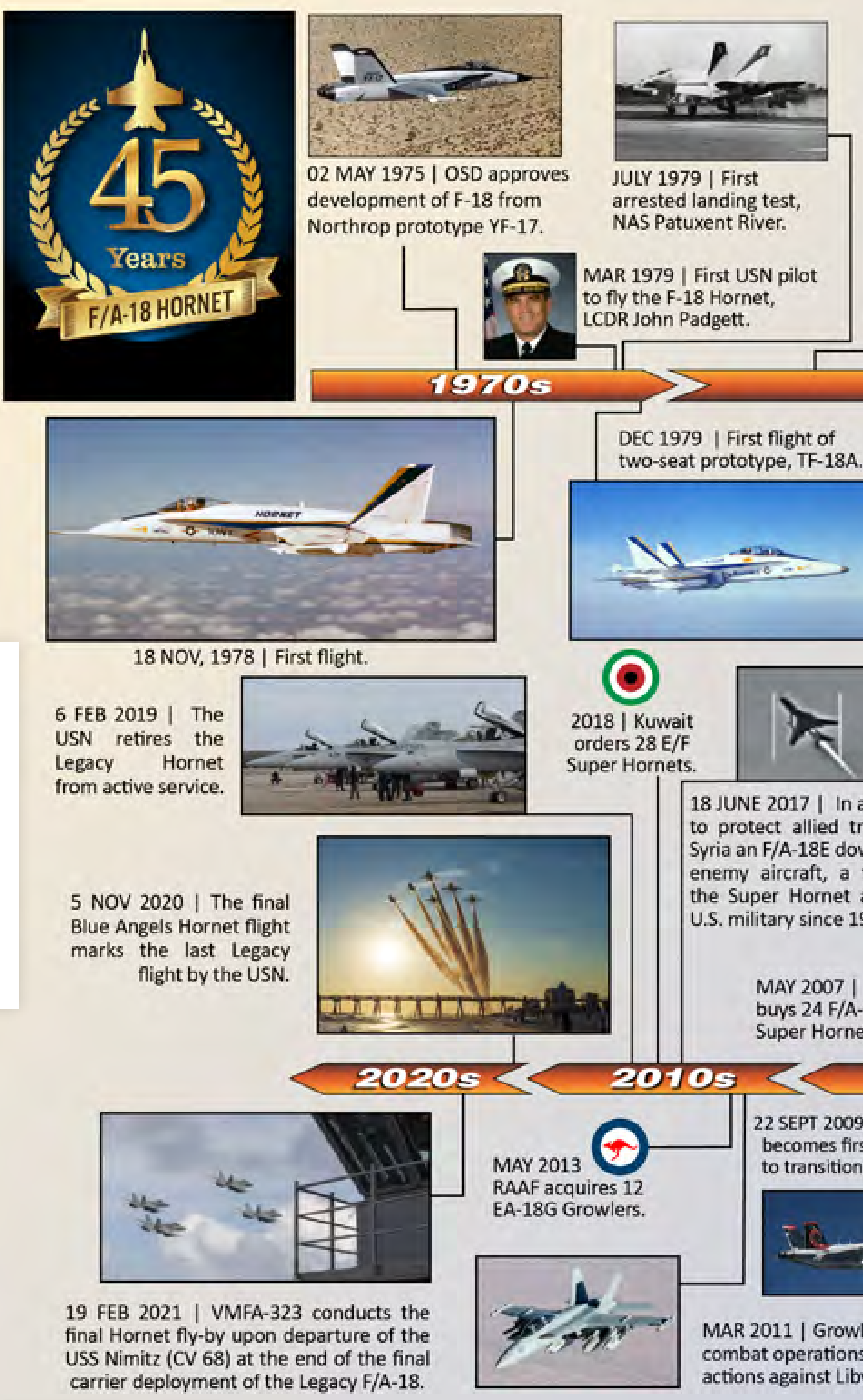
This year not only marks the 45th anniversary of the Legacy Hornet's first flight, but also the 50th anniversary of the establishment of the program office. For a half-century, the men and women of the program office have provided critical capabilities, cradle to grave, for the Hornet, Super Hornet and Growler.

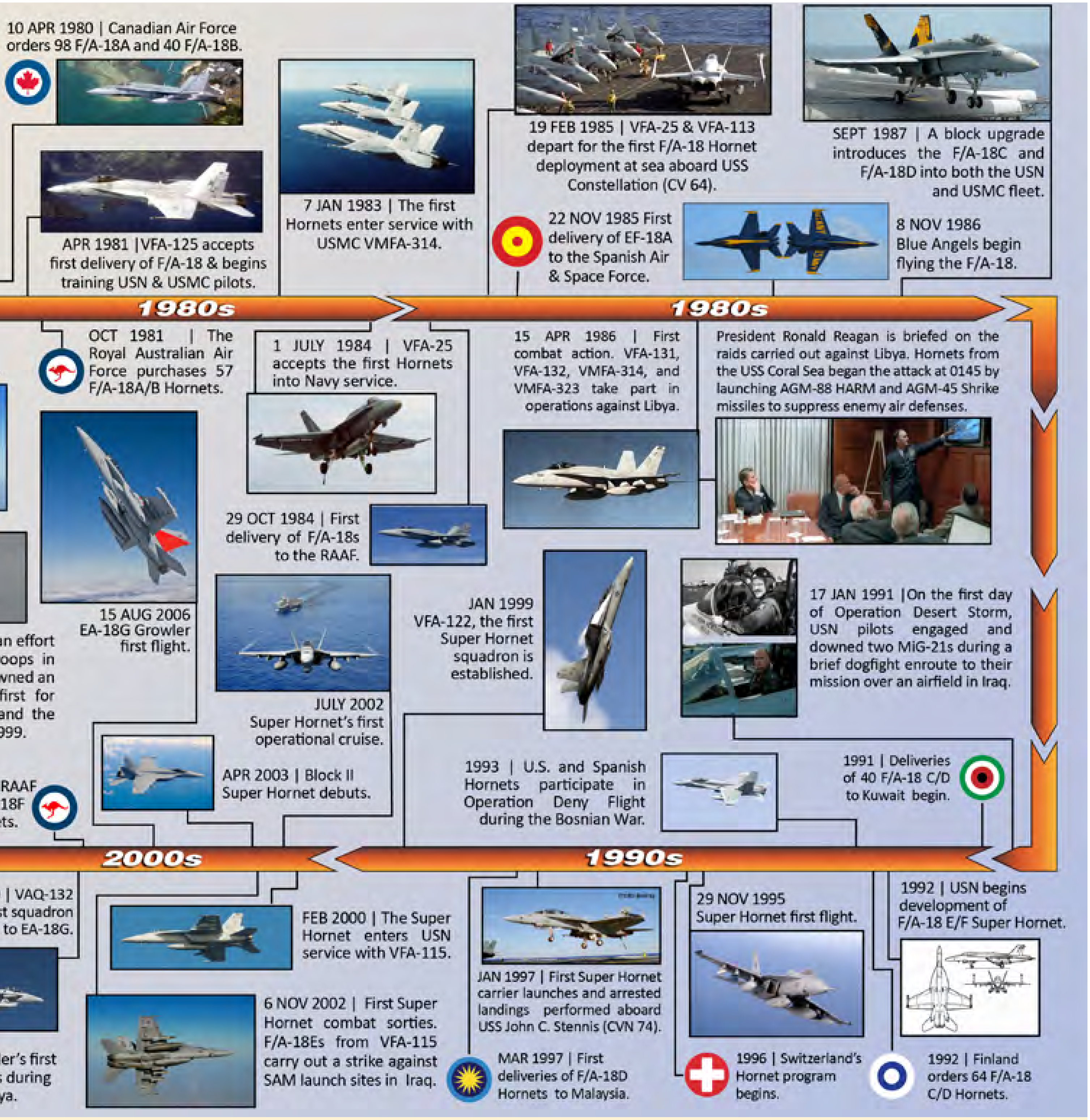
"Our team continues to move fast and take risks to support, sustain, and advance the fleet," said Capt. Michael Burks, program manager. "The technologies and capabilities that we develop are reliable, maintainable and upgradable, allowing constant improvement, so that we can best support the Sailors and Marines in the fleet."

The Hornet was just the beginning and set an expectation for fighter/attack aircraft that continues today. Over the past decade the Navy fully transitioned from use of the Hornet to the Super Hornet. This includes its use by the Blue Angels. The F/A-18 family of aircraft has surpassed 11 million flight hours. Through initiatives like Service Life Modification, the Super Hornet will be the numerically predominant aircraft in the carrier fighter air wing into the

Acronym Key:

AGM—Air to Ground Missile
CV—U.S. Aircraft Carrier
CVN—U.S. Aircraft Carrier Nuclear Propulsion
NAS—Naval Air Station
OSD—Office of the Secretary of Defense
USN—United States Navy
USMC—United States Marine Corps
VFA—Strike Fighter Squadron
VMFA—Marine Fighter Attack





Timeline courtesy of the F/A-18 & EA-18G Program Office

mid-2030s and will provide significant combat capability for the air wing into the 2040s.

"It is a privilege to be at the helm of this esteemed, dedicated workforce," Burks said. "The program office continues to ensure responsiveness, innovation, expertise, professionalism and priority when addressing the needs of our warfighters and the challenges facing our international partners; that legacy continues."

Kaitlin Wicker is a strategic communications specialist for the F/A-18 & EA-18G Program Office.

Self-Proclaimed 'Biggest Fan' of E-2 Aircraft Visits NAS Patuxent River for Tour

By Victoria Falcón

John Engelbrecht has a favorite hat and shirt—both have embroidered images of the E-2C Hawkeye aircraft on them. Engelbrecht, who turned 90 in March, loves to watch E-2 videos on the military channel, and there is no topic of conversation he likes more than the E-2C and the 25 years he spent as an engineer providing technical support for the system.

Engelbrecht's son, Scott, recently reached out to Naval Air Systems Command (NAVAIR) to see if the aircraft would be present at any upcoming airshows since, according to the younger Engelbrecht, "my dad is its biggest fan." Instead, NAVAIR, Naval Air Warfare Center Aircraft Division (NAWCAD) and Naval Test Wing Atlantic invited the Engelbrechts to come to Southern Maryland for a visit to Naval Air Station Patuxent River and a tour of the E-2D—the current aircraft variant.

The elder Engelbrecht was already an experienced engineer when he began working comparative tradeoff analysis on the E-2A and E-2B in 1965. He eventually was responsible for the mechanical interface and integration of new avionics into the E-2C weapons system. His E-2C career spanned 25 years with several different contracting companies where he provided systems engineering, technical and management support for the aircraft.

U.S. Navy photos by Michael Howard

John Engelbrecht shares some of his memories from 25 years as an engineer for the E-2 Hawkeye program. He met with VX-20 personnel and received a hangar tour of several E-2D aircraft.

"Thank you for your career efforts and many years of service to this program," said Rear Adm. John S. Lemmon, Program Executive Officer, Tactical Aircraft Programs (PEO(T)). Lemmon was on hand to greet Engelbrecht and his son, giving the senior Englebrecht a PEO(T) coin to help commemorate his visit.

"We wouldn't have the E-2D today if we didn't have the E-2C and the development work you helped to put in the aircraft," Lemmon said.

Members of the E-2D test community also welcomed the Engelbrechts and then showed them around the Air Test and Evaluation Squadron (VX) 20 hangar and several of the first E-2Ds built. Lt. Cmdr. Bradley Roby, E-2/C-2 Government Flight Test Director; Lt. Cmdr. David Chapelle, E-2/C-2 Deputy Government Flight Test Director; Lt. Harrison Ostrenga, E-2D Project Officer; Ben Hayashi, Northrup Grumman Corp. E-2D Test Naval Flight Officer; as well as two flight test engineers for the E-2D—Will Woolford and David Lower—all were available to answer questions about the aircraft and explain aircraft modifications and increased capabilities.

Some of those changes discussed by the group included increasing the number of propeller blades from four to eight, adding a probe on the front of the aircraft to allow for air-to-air refueling and removing ashtrays from the cockpit.

Engelbrecht said he and his dad will continue to watch E-2 videos on the military channel, but they are grateful for the opportunity to see the latest variant of the aircraft in person.

Victoria Falcón is a strategic communications specialist for Naval Test Wing Atlantic.

John Engelbrecht stands in front of an E-2D Hawkeye, flanked on the left by Lt. Cmdr. Bradley Roby and Ben Hashi, flight test engineer. To his right are Lt. Cmdr. David Chapelle and Engelbrecht's son, Scott Engelbrecht. Scott Engelbrecht contacted Naval Air Systems Command and Naval Air Warfare Center Aircraft Division, who helped arrange a tour of Naval Air Station Patuxent River, Maryland.

Airborne Strategic Command, Control and Com

By Kathy Hieatt

The Navy this summer accepted the first Block II E-6B Mercury upgraded entirely by Northrop Grumman Corp., an initiative that is slashing modification times thanks to practices implemented by the Airborne Strategic Command, Control and Communications Program Office.

The program office began the herculean task of upgrading each of its 16 E-6B Mercury aircraft in 2017, but quickly found that taking the planes out of service for 475 days—the average turnaround time for the first two Block II modifications completed—was not sustainable. It needed a faster way to deliver the required capabilities to the fleet.

Initially three installers were responsible for the six engineering change proposals (ECPs) required for Block II. They include a combination of mission systems upgrades and aircraft sustainment initiatives.

The solution: integrate the six ECPs into one Block II modification contract and implement practices, including Performance to Plan, to transform the process. The program office awarded the Integrated Maintenance and Modification Contract (IMMC) to Northrop Grumman in February 2022 and inducted the first aircraft under the agreement three months later, in May 2022. That was 90 days ahead of the contract schedule.

Northrop Grumman delivered that aircraft in record time—392 days—and beat that record on the second plane, which it delivered on Oct. 24 after 255 days. The North Star turnaround time (TAT) required by the IMMC is 180 days, a goal that is expected to be met by the third aircraft.

"We must achieve our target turnaround time in order to ensure our warfighters have enough mission-ready aircraft equipped with the upgraded communications capabilities that they require," said Capt. Adam Scott, program manager. "Every organization involved in producing a Block II aircraft is collaborating, identifying and solving problem areas, and setting aggressive goals to accomplish this no-fail mission, and we are seeing results."

A No-Fail Mission

The E-6B Mercury is a communications relay and strategic airborne command post aircraft. It executes the no-fail Take Charge and Move Out (TACAMO) and Looking Glass missions. TACAMO connects the president, secretary of defense and U.S. Strategic Command with naval ballistic missile forces during times of crisis. Looking Glass facilitates the launch of U.S. land-based intercontinental ballistic missiles using an airborne launch control system.

Together they provide strategic nuclear deterrence against America's adversaries.

They are deployed worldwide by air crews from Strategic Communications Wing 1 (SCW-1) out of Tinker Air Force Base, Oklahoma.

The E-6B Mercury fleet, which started as the E-6A in 1986, has been in service for 37 years and requires upgrades to continue effectively executing its missions into the foreseeable future. The six ECPs included in Block II will provide more secure, modernized communications systems.

The E-6B's successor, the E-XX, will be delivered under the TACAMO Recapitalization Program and will eventually take over the TACAMO mission.

Until the E-XX is delivered, the E-6B must be mission-ready.

munications Program Slashes E-6B Mod Times

The Navy in June 2023 accepted the first E-6B Mercury upgraded by Northrop Grumman Corp. in Lake Charles, delivering enhanced airborne strategic communication capabilities to the warfighter.

U.S. Navy photo by Kathy Hieatt

The fleet is vital to the military's nuclear command, control and communications at a time when Russia, China, North Korea and Iran are increasingly vocal about their nuclear capabilities.

"The best way for us to deter our adversaries from using nuclear weapons is by assuring them that we are always ready and willing to respond," said Scott.

The IMMC solution

The Airborne Strategic Command, Control and Communications Program Office, a Naval Air Systems Command (NAVAIR) acquisition program, began upgrading its aircraft in 2017, with three separate entities completing the work out of Waco, Texas. But without a single installer empowered to drive schedule and performance, delays ensued.

Leadership corrected course, moving to an IMMC with the goal of reducing delays by setting aggressive goals—including the 180-day TAT—embracing a Performance to Plan mindset and improving collaboration. This is the first time a single company is responsible for the entire installation, reducing bureaucracy and improving speed.

Northrop Grumman is conducting the upgrades out of its Aircraft Maintenance and Fabrication Center (AMFC) in Lake Charles, Louisiana. The $111 million IMMC is for the remaining 12 aircraft in the fleet and is scheduled for completion by 2026.

Getting Real, Getting Better

The Block II modification team consists of Northrop Grumman, V2X, the program office and Fleet Readiness Center Southeast (FRCS). Together, they're embracing the Navy's Get Real, Get Better practices to deliver required capabilities to the fleet as quickly as possible.

As the E-6B mission systems leads, Rich Wooldridge and Cmdr. Jeff Desmond led the charge, said Bob Stailey, the E-6B deputy program manager at the time.

"The Block II team aggressively tackled the challenge of improving the Block II modification process and their success is demonstrated by the downward trend in turnaround times," Stailey said. "This wouldn't have been possible without their creative thinking and fully embracing the Navy's Get Real, Get Better practices."

The team implemented process improvements that span engineering, scheduling, management and production. They improved production control on the modification line, streamlined engineering dispositions, increased support manning and established an executable integrated master schedule aimed at achieving the 180-day deadline.

They established a weekly meeting, known as a Heads Up Display (HUD), bringing all of the organizations together to report on their performance in real time, elevate barriers and workshop solutions. The HUD format improves accountability by assigning individual ownership and deadlines for specific tasks. Regular reporting of real-time data allows the team to identify and solve problems early, before they cause delays. It also ensures everyone is aligned on goals and expectations.

"The HUD demonstrates Performance to Plan in action," Scott said. "The team embraced the Naval Aviation Enterprise guiding principles and, over time, developed the trust required to openly discuss performance shortfalls and address them as a team. They established clear plans and measured performance to those plans weekly. The frequency of their interactions and the wide dissemination of information accelerated decision-making and barrier removal. By applying these Get Real, Get Better principles, the Block II modification team is expediting increased capability to the fleet."

FRCSE provided engineering, production artisan and logistician personnel in support of the E-6B Block II modification. The artisans included sheet metal workers, electricians, machinists, non-destructive inspectors and planners. All told, FRCSE contributed 26 personnel and more than 8,700 hours of work to help bring this vital upgrade to a national strategic asset.

For example, under the IMMC, Northrop Grumman was able to quickly repair a cracked tail on one of the aircraft undergoing a depot event at Tinker Air Force Base.

NAVAIR Commander Vice Adm. Carl Chebi recently explained why Get Real, Get Better practices, such as those employed by the program office, are vital to the success of the Naval Aviation Enterprise (NAE).

"Today's challenges require the NAE to think, act and operate differently," Chebi said. "The rules of the game have

The Navy in June 2023 accepted the first E-6B Mercury upgraded by Northrop Grumman Corp. in Lake Charles, delivering enhanced airborne strategic communication capabilities to the warfighter.

U.S. Navy photo by Kathy Hieatt

changed, requiring the NAE to change and adapt. This is the impetus behind CNO's call to Get Real, Get Better and the launch of the Capability, Availability and Affordability North Star initiatives."

Continued challenges include material condition discovery, part supply backlogs and manpower, but the team is well-equipped to overcome them, Scott said.

The IMMC also provides another benefit: maintenance flexibility. In addition to the six Block II ECPs, the contract provides options for Northrop Grumman to perform depot-level in-service repairs (ISRs) as needs arise. This saves time and money—especially on critical ISRs that ground an aircraft—and improves overall fleet readiness.

The program office inducted the third aircraft under the IMMC on Aug. 18 and expects delivery in February 2024.

Kathy Hieatt is a public affairs officer for the Airborne Strategic Command, Control and Communications Program Office.

SIMPLE FIX PREVENTS CATASTROPHIC F-35 ACCIDENT

By David Byrd

A simple, "washer-like" design helped avoid a serious F-35 Lightning II accident in mid-October and enabled an uneventful landing at Marine Corps Air Station Cherry Point, North Carolina.

About the size of a fingernail, the conical device fits into the aircraft engine's fuel line to mitigate the effect of a ruptured fuel line, such as the one that caused a Class A F-35B mishap at Naval Air Station Joint Reserve Base Fort Worth, Texas, in mid-December 2022. The DoD defines a Class A mishap as one that costs more than $2 million, causes a fatality or results in the total loss of an aircraft.

There were no fatalities during the mishap and engineers and specialists are still trying to determine if that aircraft is salvageable.

"The Pratt & Whitney F135 engine uses fuel pressure to control actuators in the engine. When you lose that fuel pressure, you lose control of the engine," said Mike Reedy, the lead propulsion engineer with the F-35 Lightning II Joint Program Office. "The washer doesn't prevent the fuel line—or what we more aptly call the fuel-draulic line—from cracking and failing, but sustains the pressure needed to maintain engine control."

Reedy likened a failure without the washer to a car trying to merge onto a highway.

"It's as if you were driving your car and stepped on the accelerator, but nothing happened, or nothing happened for five seconds. Plus, your steering wasn't responsive.

"With your car, it's dangerous, but with a single-engine aircraft, that is catastrophic."

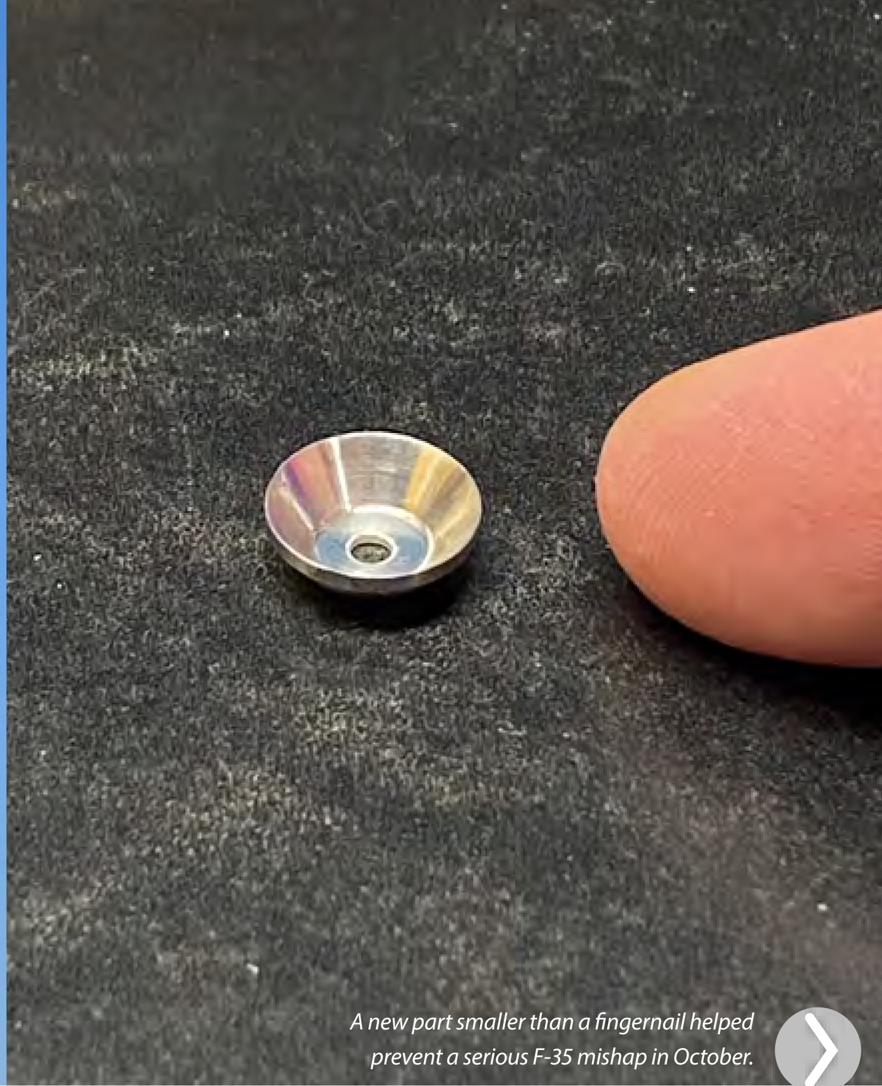
During the October Cherry Point incident, the pilot received an alert that manifests after the vulnerable fuel-draulic line ruptures with the washer in place. After an uneventful landing, ground inspection confirmed a fuel leak identical to the one that caused the crash at Fort Worth.

"Better a relatively benign event than an accident," Reedy said. "We directly prevented a loss of aircraft."

Following the Fort Worth accident in December, the F-35 JPO team immediately began work to determine the cause of the incident and produce a solution. The washer was the first thing the team came up with.

Marine Corps pilot Maj. N.H. "Robo" Thayer conducts conventional landing of his F-35B Lightning II onboard Naval Air Facility (NAF) El Centro, California.

U.S. Navy photo by MC3 Drew Verbis


A new part smaller than a fingernail helped prevent a serious F-35 mishap in October.

U.S. Navy photo by Mike Reedy

"It was so successful we didn't need to try anything else," Reedy said. "More exotic designs were proposed, but because of [the washer's] simplicity and effectiveness—validated through extensive testing—and ease of installation, no other near-term mitigations were pursued.

"The only day we didn't meet those first weeks was Christmas Day. I was blown away with how the team came together to design, fabricate and test the part. It was a tremendous effort. By March 2023, we started installation."

"This was a team win that included JPO, P&W and Lockheed Martin. All had a hand in this success. The unfortunate circumstance that brought this team together yielded a model for government/industry working relationship," he said.

Somewhat counter-intuitively, the JPO began to field the solution on its new and low-time engines rather than older engines.

"The Fort Worth incident and a similar occurrence in the engine acceptance phase in 2020 happened on low-time engines," Reedy said. "If the line is going to rupture, it is going to rupture early."

"After the 2020 incident, we incorporated a screening procedure during the engine acceptance test. The 2022 incident demonstrated that we needed a hardware fix in addition to the screening procedure."

Since March 2023, the interim solution has been included in engine deliveries off the production line. A complementary retrofit campaign affected about 1,000 F135 fielded engines, new and old alike. Engines belonging to partner nation and international customers would also be retrofitted.

"The core engine is the same on the A, B and C models, so this work affects all of them," Reedy said. "The [Short Take-Off and Vertical Landing] STOVL (B Model) is most critical considering the way it is recovered on a ship. During low speed approach and hover unique to the STOVL variant, it is reliant on the propulsion system for aircraft control because there is minimal-to-no lift created by the aircraft's wings."

Despite its success, the device is an interim fix until a permanent solution is implemented beginning late this year. "The permanent solution to the vibration problem is a more robust fuel line. The washer is highly effective, but doesn't prevent the line from rupturing. We will start installing the improved fuel line in December 2023 and plan to be finished in late 2024. That said, we are also going to include the washer in the new fuel line as well."

According to the Congressional Budget Office, last year the Department of Defense operated about 450 F-35 aircraft, with plans to fly 2,500 of them by the mid-2040s.

David Byrd is editor-in-chief of Naval Aviation News.

Fleet Readiness Center Southeast Inducts First F135 Power Module, Begins Artisan Training

Fleet Readiness Center Southeast (FRCSE) inducted its first F135 Power Module (PM) Aug. 24, one of the five major modules that make up the propulsion system on the F-35 Lightning II Joint Strike Fighter.

After being designated as a Department of Defense second depot source of repair (DSOR) for the F135 engine, FRCSE quickly began planning for the arrival of its first PM and future sustainment as a second DSOR.

"The F-35 will be around for a long time, and earning this workload creates a unique opportunity for the depot to firmly assert its place within the Naval Aviation Enterprise (NAE)," said FRCSE's Commanding Officer Capt. Al Palmer. "The intent for this engine work is to begin within FRCSE's Crinkley Engine Facility and then expand as other support facilities are created. Seeing an effort of this enormity come to fruition takes a dedicated team of professionals. Among many other invaluable partnerships, the experts at Pratt & Whitney (P&W) and the Joint Program Office (JPO) were vital to both receiving the work and learning the skills needed to maintain it."

To support this new engine and its modules, artisans must undergo extensive training. With help from Heavy Maintenance Center (HMC), Tinker Air Force Base (AFB), Oklahoma, and P&W at West Palm Beach, Florida, some training has already been conducted. However, an additional three-phase P&W training and maintenance qualification and certification process, which will enhance and streamline the process for FRCSE personnel, has also kicked off onsite at the command.

The training encompasses classroom and on-the-job (OTJ) experience as artisans learn and familiarize themselves with the PM and its associated mini modules (MMs)—the high-pressure compressor, high-pressure turbine, low-pressure turbine and diffuser combustor.

"Many different competencies will be involved with F135 training," said Carl Cuppy, FRCSE's Business Development Office Engine Lead. "Mechanics, inspectors and quality assurance personnel will all participate in the training. During this time, groups will develop the muscle memory necessary to overhaul the F135 power module successfully. Each group will perform multiple iterations of disassembly and assembly with the support of Pratt & Whitney training specialists."

While the process will be rigorous and lengthy, it's a vital part of gaining the necessary proficiencies. Fortunately, all personnel undergoing the training are seasoned experts with aircraft engine experience —having worked on platforms like the

Fleet Readiness Center Southeast (FRCSE) recently received its first F135 Power Module (PM). The PM is one of the five major modules that make up the propulsion system that powers the F-35 Lightning II Joint Strike Fighter.

U.S. Navy photos by Toiete Jackson

Fleet Readiness Center Southeast (FRCSE) recently received its first F135 Power Module (PM). The PM is one of the five major modules that make up the propulsion system that powers the F-35 Lightning II Joint Strike Fighter.

F414 and F404, the muscle behind the F/A-18 Super Hornet and Hornet respectively, the TF34 which powers the Air Force's A-10 Warthog, and the J52, which was used in the EA-6B Prowler.

The first two training phases will focus on classroom and practical skills. The first was approximately two weeks long and taught artisans P&W's digital management system for the engine.

During OTJ, or the second phase, artisans will begin working with the PM, its MMs and each subcomponent. P&W trainers will work side-by-side with FRC Southeast personnel.

"The Power Module is its own specialty, and each mini module is its own specialty," said Chadwick Boyd, FRCSE industrial engineer and F135 capability establishment team member. "Artisans will specialize in a mini module and only be tested on their specialty. However, there will be opportunities to cross-train."

OTJ will be broken into each MM's subcomponents, with completion of each of the four areas contingent on the amount and complexity of its subcomponents. Completion dates for each MM training are expected between February and April 2024, and the PM training will conclude by June 2024.

Once the classroom and practical OTJ phases are complete, qualification and certification will be the final step. This involves a collective skills assessment, in which P&W evaluators will determine whether the command can achieve Initial Depot Capability (IDC). As part of the assessment, artisans will be required to completely disassemble and reassemble the power module without guidance or assistance. Earning the IDC will demonstrate that FRCSE can perform all maintenance actions on this specific section of the F135.

"The first power module will be disassembled into mini modules, or sub-assemblies, used for training on those specific components," Cuppy said. "The second power module will be used for the disassembly and assembly training for the PM. Both PMs will be assembled into production units and eventually installed in F-35 aircraft within the international enterprise."

The second F135 PM was delivered to FRCSE on Aug. 28.

IDC assessment for MMs are scheduled between September and October 2024, and between March and April 2025 for PMs.

FRCSE has optimized space in its Crinkley Engine Facility complex to make room for the F135 product line, but that is far from all that the organization is doing to support this large-scale effort. After certification, F135 artisans will conduct the MM and PM work in designated areas within the facility called "cells." The long-term plan is to have nine PM cells and 22 mini module cells.

As the program ramps up in the coming years, the command will build new facilities via military construction (MILCON) projects to support the increased workload.

"FRCSE is in the design review process for a state-of-the-art 250,000-square-foot MILCON facility constructed specifically to house the F135 maintenance shops and support personnel," Cuppy said. "Further, we expect our local (engine) test cell project to be commissioned by this time, which will allow FRCSE to become a one-stop-shop for F135 maintenance, repair and overall."

Cuppy said the command anticipates engine production to ramp up through 2034 to the maximum production requirement - equivalent to about 600 MMs and 120 PMs annually, correlating to about 600,000 man-hours.

"We will start regular inductions in 2024, and we expect to have every component of the F135 Navy and Air Force variants by 2029," Cuppy said. "During that time, we will begin training for the fan, augmenter and nozzle modules."

FRCSW/FRCSE Complete Final F/A-18 Hornet Center Barrel Replacement

Whether due to its all-weather versatility and reliability, or its run with the renowned flight demonstration team, the U.S. Navy Blue Angels, the F/A-18 Hornet has been a combat-proven platform for the Navy and Marine Corps for many years.


U.S. Navy Photo by Toiete Jackson

A Fleet Readiness Center Southeast (FRCSE) weight and handling crewmember helps to stabilize an F/A-18 Hornet as it is repositioned using a crane as part of a Center Barrel Replacement (CBR) maintenance evolution.

It is a historic aircraft with an extensive past—one that would certainly not be as long or successful without a service life extension process called Center Barrel Replacement (CBR)—a complex and lengthy repair developed in 1991 by Fleet Readiness Center Southwest (FRCSW) and conducted exclusively by artisans at FRCSW and Fleet Readiness Center Southeast (FRCSE).

In fact, FRCSE and FRCSW both recently completed their last legacy F/A-18 CBR.

"Congratulations to the entire team of personnel that not only completed this final Center Barrel Replacement, but have also been the lifeblood of the CBR program here at FRC Southeast," said FRCSE's Commanding Officer, Capt. Al Palmer. "We conduct many difficult repairs, but CBRs demand a level of artisan skill that reminds us of how talented our workforce is here at FRC Southeast."

The Legacy Hornet originally soared into the Navy and Marine Corps arsenal in the 1980s with an expected service life of 6,000 flight hours. Like most things, an aircraft is only as strong as its parts, and after years of hard landings aboard aircraft carriers at sea, it was discovered that the aircraft's fuselage section or center barrel, was particularly susceptible to damage.

"Thousands of rough landings at sea and G-forces create an incredible amount of stress on an aircraft in general, but the center barrel on a Hornet has several key attach points that are particularly vulnerable to stress," said Rebecca Ferguson, FRCSE's F/A-18 Legacy Hornet production lead. "The landing gear and wings connect to the fuselage at the center barrel. Replacing this structural piece helps ensure the aircraft remains airworthy."

To prolong the aircraft's life, highly skilled and talented artisans conduct a CBR by situating the jet on a sturdy support frame, or center barrel fixture, splitting it in half and laboring thousands of hours drilling thousands of fasteners to free the fatigued component.

Once removed, artisans carefully drop in a new center barrel, which Northrop Grumman manufactures in the form of a kit, and then FRCSE's skilled artisans go through the entire drilling and riveting process again, ensuring every hole is methodically bored one size up to accommodate a larger fastener—approximately 20,000 fasteners first drilled out, then drilled in.

Depending on its condition and other planned depot maintenance evolutions, such as a High Flight Hour (HFH) inspection and Planned Maintenance Interval (PMI), a CBR can take up to three years to complete, costing the Navy approximately $3 million per aircraft. While it may sound expensive, this repair is a fraction of the cost of a new aircraft.

"The repair is extensive and usually accompanied by other depot HFH and PMI evolutions," Ferguson said. "The nature of the repair requires artisans to spend years with these aircraft, which doesn't just take technical know-how and meticulous attention to detail, but also a real sense of pride in the work performed. FRC Southeast and FRC Southwest CBR artisans and engineers are why these aged aircraft are still flying over 40 years later—long past their expected lifecycle. It's truly an incredible feat."

As a few artisans gathered to watch the last CBR Legacy Hornet taxi down the flight line at Naval Air Station Jacksonville, Florida, an instrumental chapter of FRCSE and aviation history has concluded, opening the door for even greater innovation and challenges to come.

First Full Paint Scheme Performed on Unmanned Helicopter at FRCSW

This year, Fleet Readiness Center South West (FRCSW) became the first depot to complete a full paint scheme for an MQ-8C Fire Scout. FRCSW artisans meticulously stripped and painted the aircraft, a task crucial for its longevity and operational readiness.

Surface preparation was key.

Typically using a hand sanding technique—as opposed to media blasting or chemical stripping hazardous to the environment and employee alike—specialists cleaned and stripped the aircraft's surface to remove existing paint, coatings or contaminants. Hand sanding was also generally healthier for the aircraft and lowered the likelihood for damage and rework. After surface preparation, a primer coat was applied to enhance adhesion and corrosion resistance. Using spray guns or specialized painting techniques, artisans then applied the base coat, which included the color and any markings or insignias desired by the squadron. Finally, a clear protective layer was applied over the base coat to provide additional durability. Throughout the process, masking techniques were used to ensure precise application and prevent paint from reaching areas where it should not be.

Stripping and painting was essential to the MQ-8C's longevity and operational readiness for several reasons. It maintained the aircraft's structural integrity, and allowed for detailed inspections, repairs and maintenance of the aircraft's surfaces. It also contributed to the overall longevity and serviceability of the aircraft. In addition, MQ-8C aircraft operated in various environments, including high humidity, saltwater exposure, and extreme temperatures. The paint system acted as a protective barrier, shielding the aircraft's metal surfaces from corrosion caused by moisture and other agents. Moreover, military aircraft often required specific camouflage patterns or colors to blend with their operational environment, such as forests, deserts or open ocean. The paint job made the aircraft less visible and harder to detect by enemy forces. Proper strip and paint procedures ensured that the aircraft displayed the appropriate national insignias, identification codes, unit markings and other required visual cues. These markings facilitated quick identification by friendly forces and aided in effective communication during military operations.

For heat management, some specialized coatings or heat-reflective paints can be applied to aircraft surfaces to manage heat absorption, particularly for areas exposed to high temperatures from engines, exhaust, or other sources. This helped prevent excessive heat buildup and potential damage to sensitive components. By ensuring proper strip and paint procedures, military aircraft maintained their operational readiness, protect against corrosion, enhanced camouflage, facilitated identification, managed heat, and extended their service life—all crucial factors for military effectiveness and safety.

U.S. Navy Photo by Janina Lamoglia

FRCSW artisan's meticulous handiwork breathes new life into an MQ-8C with a flawless paint transformation.

The MQ-8C Fire Scout, a variant of the MQ-8B, is an unmanned aerial vehicle used for expeditionary operations aboard ships. The Navy's only unmanned helicopter, deployable from land or sea, it provides target-acquisition, real-time intelligence, surveillance and reconnaissance to the men and women of the US Navy and Marine Corps. In 2015, Naval Air Systems Command designated FRCSW as the location for all maintenance and repair workload on the MQ-8 airframe.

In charge of the process for planning, labor estimates, material and tooling requirements, Jay Noblin and Jeremy Gates are two key leaders that spearheaded the successful enhancement and preservation of the MQ-8C at FRCSW.

"It was a good team effort between engineers and artisans to complete the MQ-8C in what we all believe is a very timely manner," Gates said.

"We have been lucky to have good leadership that knows about this process and they're taking what they learned from one aircraft variant to the next," Noblin said.

Described by Noblin as being "leaders in this rework," the command successfully completed the full paint scheme of the MQ-8C in just two weeks and at a cost lower than any other organization. As the first depot to complete the full paint scheme for the MQ-8C, FRCSW set the standard and is looking forward to completing future Naval Aviation advancements and solutions.

Professional Reading

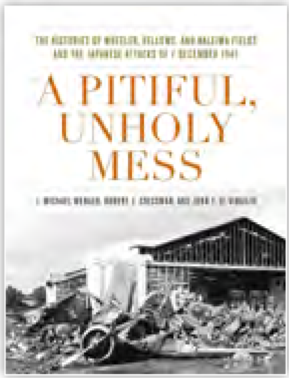
By Cmdr. Peter B. Mersky, USNR (Ret.)

Introduction to Fall Professional Reading

A quick look at the reviews in the Fall column will show a focus on the Japanese attack on Pearl Harbor, certainly one of this country's history's seminal events that thrust us into what had been a major war involving mainly European countries: the so-called Axis, Nazi Germany, Fascist Italy, and Japan, as of Sept. 27, 1940, along with Albania, Bulgaria, Hungary, Rumania, and Thailand, against The United Kingdom, France, and other smaller nations (Turkey remained neutral through most of the war, but eventually joined the Allies in February 1945) that were threatened by Nazi dictator Adolf Hitler, such as Denmark and Norway, and soon, the much larger Soviet Union. Imperial Japan had long been intent in bringing China, Thailand, and other small countries in Southeast Asia into a co-prosperity sphere referred to as "Asia for the Asians," basically an anti-West bloc that would stand up to increasing Western influence that Japan's military rulers deeply resented and vowed to tame. As modern and well-equipped though the Japanese Army and Navy were by 1940, forays into China and Manchuria beginning in 1931 and intensifying in 1937 with heavy bombing of major Chinese cities, not to mention action against an American gunboat, the USS Panay on Dec. 12, 1937, served to illustrate just how serious Japan was in pursuing its nationalistic program in dominating as much of Asia that it could, no matter how long it took.

The British operation against the Italian Navy in Taranto Harbor on the night of Nov. 11-12, 1940, gave the attentive Japanese rulers (no matter how often they would deny it) the seed of an idea to attack the U.S. Navy and Army's main bases in the Hawaiian islands. They took it from there, planning, refining, training for and ultimately flying what became the successful operation on Dec. 7, 1941, against the Navy's fleet at Pearl Harbor, a number of U.S. Army air bases near the harbor as well as raids against American installations in the Philippines on Dec. 8, as well as the highly successful destruction of two major British Royal Navy ships on Dec. 10. The Pacific War was on, and soon Nazi Germany and Fascist Italy, and one-time ally Turkey and a few European nations allied with the Axis were arrayed for the monumental struggle for their lives for the next four years. Millions of civilians and service members of many of the world's countries, large and small, were ultimately killed and injured, and the world's geography was changed, and indeed, is still changing as a result of what became known as World War II. In reality, we have yet to see the final result of the early-morning Japanese raid against America's far-flung bases in the Pacific.

— Peter B. Mersky



"A Pitiful, Unholy Mess:" The History of Wheeler, Bellows, and Haleiwia Fields, and the Japanese Attacks of 7 December 1941.

By J. Michael Wenger, Robert J. Cressman and John F. Di Virgilio. Naval Institute Press, Annapolis, Md. 2022. 336 pp. Ill.

After a lengthy essay on the exploration and settlement of this portion of Oahu in late 1922, the authors begin this fascinating history of the establishment of the U.S. Army air base in Hawaii. Initially, its strategic importance seems to have been overshadowed by its almost paradise-like atmosphere with idyllic settings, beaches and exotic distance from the U.S. mainland. Photos of buildings, airfields and especially the Army aircraft of the period, taken from little-known collections, augment the interest of this fourth book in the exhaustive "Pearl Harbor Tactical Studies Series" of the Japanese attack that thrust America into World War II.

An additional trove of information is the highly detailed number of related activities and placement of maintenance squadrons responsible for aircraft upkeep and performance, subject areas rarely addressed in between-war histories.

Photo courtesy of National Archives and Records Administration (NARA)

Army aircraft destroyed by Japanese raiders at Wheeler Air Field, photographed later in the day on Dec. 7, 1941, following the end of the attacks. Wreckage includes at least one P-40 and a twin-engine Grumman OA-9 amphibian. Note the wreckage of Hangar 3 in the background.

Photo courtesy of NARA

Men examine the burned-out wreckage of a P-40 fighter, possibly from the 78th Pursuit Squadron near Hangar 4 at Wheeler Air Field, following the end of the Japanese raid. Note the long blast tubes for the aircraft's two .50-caliber nose machine guns. The early P-40s also had four wing-mounted .30-caliber machine guns. Before the raid, there were 99 P-40s available from various squadrons around the several bases. By day's end, only 27 remained operational.

Photo courtesy of NARA

A wrecked Army Air Forces B-17C bomber (serial number 40-3074, indicating it had been manufactured in 1940) near Hangar 5 at Hickam Air Field, following the end of the Japanese raid. This aircraft, piloted by Capt. Raymond T. Swenson, was one of those that arrived during the attack after flying from California. It was hit by a strafing attack after landing and burned in half.

The somewhat lengthy dissertation of pre-raid (Dec. 6-7) activities of a few Army members, bars and parties slows the narrative down but does give an impression of how truly unprepared America was for the devastating attack and the war, particularly the administration of President Franklin D. Roosevelt far away in Washington, D.C.

The mention of then-2nd Lt. Francis S. Gabreski (1919-2002) on page 140 during the attack then assigned to the U.S. Army Air Forces' 45th Pursuit Squadron flying Curtiss P-40 Tomahawks as well as Curtiss P-36s based at Wheeler Field, certainly adds dimension to the narrative. He later became a ranking American fighter ace in Europe flying Republic P-47 Thunderbolts, and with a tour during the Korean War in mid-1951 flying North American F-86s that added 6.5 more kills over Communist MiG-15 jet fighters, his final total was 34.5 kills in two wars.

Gabreski found a P-36 radial-engine fighter and joined six other P-36s and two P-40s as they took off to intercept the remaining Japanese raiders as they departed the area on the way back to their carriers. However, by the time the mixed group of Army fighters got to altitude, the sky was empty of Japanese aircraft. Although the American pilots continued to fly a limited patrol, being careful to avoid occasional fire from still-nervous ground crews, they eventually began

Courtesy of J. Michael Wenger

Ground crewmen cannibalize B-17C, serial number 40-2049, which landed at Bellows Field piloted by 1st Lt. Robert Richards, for other B-17s at Hickam. The Plexiglas nose canopy has already been taken as has the port wing tip, two engines, an aileron and the observation bubble behind the cockpit. The B-17C and later D were the last models before a twin .50 caliber machine gun tail station was added to the next variant B-17E to greatly improve the bomber's defense armament.

A P-36A of the 18th Pursuit Group is rolled to its position on Wheeler's parking apron in 1940. Most P-36s were unpainted, as opposed to the olive-green P-40s that shared the defense duty around the bases in the Pearl Harbor complex.

Courtesy of J. Michael Wenger

Photos courtesy of J. Michael Wenger

This early P-40 is from the 18th Pursuit Group, and the ground crew is bore-sighting its twin nose-mounted .50-caliber machine guns at Bellows Field sometime in the summer or fall of 1941. This procedure ensures the guns' bullets converge at a desired range.

This P-36A is in front of Hangar 2 and may have been flown by 1st Lt. Lewis M. Sanders, CO of the 46th Pursuit Squadron on the morning of Dec. 7. It appears that the workers have raised the covers of the breeches of the nose .50-caliber machine guns. Sanders received the Silver Star for leading four P-36s against a formation of Japanese Zero fighters, with a furious dogfight developing.

2nd Lt. Philip M. Rasmussen was part of Lt. Sanders' formation that attacked Japanese Zeros in a major dogfight that showed that American forces were finally able to confront the raiders in force. In this photo, he is pointing to various bullet holes in his P-36A from the Zeros. Some of the holes are from the Zeros' wing-mounted 20mm cannon. Rasmussen also received the Silver Star. He and Sanders each claimed one Zero.

running low on fuel and had to return to their smoking field.

Chapter 8 finally begins the narrative of the attacks on these airfields (Wheeler, Bellows and Haleiwa) with details of where people were at the time. The main raid on the harbor was surprisingly intense and destructive and is well-covered in preceding volumes we have reviewed. The Navy lost many ships, either sunk or heavily damaged. Thousands of military and civilian personnel were killed or wounded. What pilots like 2nd Lts. Ken Taylor and George Welch of the 47th Pursuit Squadron were doing—taking off in P-40s to finally intercept and shoot down several Japanese aircraft, doing what they could to defend American airfields—has been well-covered in various accounts, especially the 1969 movie "Tora, Tora, Tora." After achieving 16 kills in the war, Welch died on Oct. 12, 1954, in a flight mishap while test-flying North American F-100 Super Sabres.

Taylor also went through the war, getting two officially-credited kills of Val dive bombers over Pearl Harbor, although the exact number was open to question as another two kills he claimed in 1941 were never confirmed. His official number of confirmed kills for the war overall remained at four until post-war research, supplemented by Japanese records, indicated that two additional claims he made over Pearl Harbor were confirmed for a total of four that day, bringing his total during the war to six. He had shot down two more, one each in January 1943 and on Dec. 7, 1943, the one-year anniversary of the Japanese attack on Pearl Harbor. Officially, however, his status as an ace is apparently not recognized by the American Fighter Aces Association, at least not in their large white album, which describes in brief paragraphs each American ace's life and career.

Taylor retired from the Air Force in 1967 as a colonel, but entered the Alaska Air National Guard, working as the Assistant Adjutant General, retiring as a brigadier general in 1971. His son, Kenneth M. Taylor, Jr. also retired as a one-star general from the very same position his father had occupied when he retired.

Another Air Force story that is part of the attack is that of 12 B-17 Flying Fortresses flying from the mainland to Hawaii. This new volume in this series describes their crews' experiences in great detail. The four-engine bombers that were at the time the flag ships of the USAAF's bomber force were from the 38th and 88th Reconnaissance Squadrons based in California. Their young crews were eager to make the long-range flight to Hawaii. Their arrival over Pearl Harbor, smack in the middle of the attack, is well-shown in "Tora, Tora, Tora," as their surprise turns into action trying to extract themselves from the swarms of Zeros and Val dive bombers. (Fortunately, when the film was being shot, there were enough flyable B-17s and adequate numbers of former U.S. trainers that could be modified to look like the squadrons of Japanese carrier fighters, dive bombers and torpedo bombers to make the film look as realistic as it did).

The lead-in sequences depicting the establishment of an Army radar site, the enlisted operators of which struggle to call their officer supervisors' attention to what they saw as the rapidly approaching enemy force add to the drama that everyone who saw the film knew what was coming, probably much like knowing how a mystery ends because they read the book.

The bomber crews had to quickly find adequate substitutes landing grounds, often while being pursued by Zeros. The bombers were unarmed and very low on fuel, which made their situation that much worse. All of this dire situation is detailed in the book, both in text and in post-raid photos.

As with the other three books in this unique series, the individual windows they provide give such an intense look at the damage and personal impressions of the participants on either side go far beyond other accounts have offered in the 82 years since the attack, covering, of course, the Navy's side where so many ships and their crews were badly damaged or sunk outright, or whose lives were lost. One can be forgiven if he compares the coverage of 9/11 in 2001 and the Japanese raid on Pearl Harbor, the two most shocking events in modern U.S. history by other major countries or enemies that haunt the American psyche. They thrust America into the monstrous world conflict that we as a people and a government had tried to avoid for many years, and yet ultimately were forced to face and participate in for three-and-a-half very long years.

In what I acknowledge is a deeply personal assessment, I firmly believe these four books are definite candidates for nomination for the Pulitzer Prize.

Courtesy of J. Michael Wenger

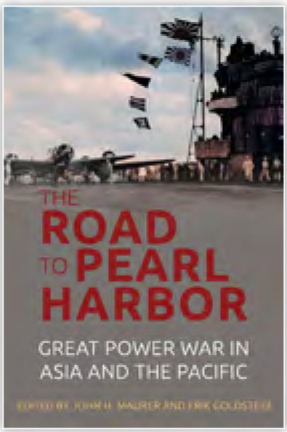
A post-raid lineup of some of the Army aviators who chased the departing Japanese raiders and shot a few down. They pose in front of the P-36A that 2nd Lt. Harry W. Brown flew. From left to right: P-36 pilots 1st Lt. Lewis M. Sanders and 2nd Lt. Philip M. Rasmussen, each pilot got one Zero, P-40B pilots 2nd Lts. Ken Taylor and George Welch, together, scored six confirmed kills (Welch with four and Taylor with two, although post-war research added two more to Taylor's total on Dec. 7).

Courtesy of The National Museum of the U.S. Air Force

2nd Lt. Francis S. Gabreski of the 45th Pursuit Squadron, Wheeler Air Field, lounges on the wing root of a squadron P-40 named "Miss Kay." Unable to find a ready-to-go P-40, he discovered a P-36A and took off after departing Japanese aircraft. Although he tried to reach the raiders' altitude, they were gone by that time. His career in Europe, and later in Korea, flying F-86A Sabres, gaining 6.5 kills over Communist MiG-15s, gave him a total of 34.5 kills in two wars. He retired in 1967 as a colonel.

Courtesy of The National Museum of the U.S. Air Force

Between his time at Pearl Harbor and his time flying P-47s in Europe, now-Capt. Gabreski flew an exchange tour with No. 315 Squadron, which was actually a squadron of the exiled Polish Air Force. Of Polish heritage, he spoke the language, which helped him work with the squadron's pilots anxious to continue fighting the German Luftwaffe. He flew a total of 13 missions from December 1942 to February 1943—he did not gain any kills during this tourbefore transferring to the USAAF's 56th Fighter Group where he flew P-47 Thunderbolts, gaining 28 kills before being shot down and captured on July 20, 1944, on what would have been his final mission while strafing Heinkel 111s on an airfield.



The Road to Pearl Harbor: Great Power War in Asia and the Pacific

By John H. Maurer; Edited by Erik Goldstein. Naval Institute Press, Annapolis, Md. 2022. 209 pp.

This new book on the Japanese attack is more of a scholastic treatise, published as it was without a single photograph, except for the one on the front cover, which I find highly unusual in today's publishing market. Photos are always required, if only to relieve very dry presentations and perhaps make the reader's job easier, as this book's struggles to keep one's attention. For some reason, the first chapter is incredibly verbose and complicated on how the attack on Pearl Harbor might be planned and accomplished.

It's obvious the Japanese had decided on war to establish their policy of Asia for the Asians. They were never satisfied with the results of the various post-World War I armament conferences that creep in and out of the stuffy essays that are a large part of the book's text. The presenters' language is frustrating and goes a long way in reducing any understanding of their subject. I found myself wondering if I needed to keep a dictionary by my side.

A few specific notes

Page 125: FDR had a distinct favoritism for Chiang Kai-shek as he struggled to lead his people toward independence while fighting the brutal Japanese, who delighted in kicking them (including refugees from Europe trying to make their way from their home countries now part of the growing Nazi empire) off the sidewalks so Imperial Japanese Army soldiers could walk them unimpeded by other humans.


Photo courtesy of NARA

This Type 99 D3A1 dive bomber from the carrier Kaga was shot down by flak, losing its tail section before crashing in the harbor by the destroyer-minelayer USS Montgomery. Note that the dive bomber's flotation bags have been deployed over the wings.

Page 131: As the book progresses, it would appear the editors are trying to show how war in the Pacific against the Japanese was inevitable and would start first in Hawaii.

Chapter 5: There are many esoteric words that seem to assume the reader knows their meaning without a dictionary, such as "delphic" in line 7. Page 133: "Autarky" line 7, "Nazi Kristallnacht pogrom," same page, line 38 (a major antisemitic event in November 1938, that many modern readers may not know). I could go on. The editors would have done themselves and their potential readers a service by explaining or elaborating these words and terms.


Courtesy of J. Michael Wenger

This Type 99 is carrying one 250 kg (551 pounds) bomb on its centerline station as it launches from the Kaga's flight deck. The time is 0715 hours on Dec. 7, 1941. The dive bomber is part of the attack's second wave.

The book's page count is low enough that it could spend several brief expansive additional words of definition.

The book is a strong indictment of Japan's between-war intentions and interactions of working with other countries to prevent another world conflict. One of the main rejection themes seems to be President Franklin D. Roosevelt's continued vacillation on how to deal with Japan when it became increasingly clear how bent on war Japan was.

Finally, given current concerns on modern-day China's growing military muscle and ambitions, it could be that the mainland's intent to reaffirm what the pre-WWII Japanese were thinking in the late 1930s may be actually to bring back the Asia for Asians national philosophy. Books like "The Road to Pearl Harbor" could possibly have more substance for the West than at first reading. Frankly, it remains to be seen whether there may be examples of Western denial of what Japan's WWII Zero fighter represented in today's edition of eastern capabilities opposing existing Western types, and I wonder if, this time around, we have the time to explore these possibilities.

Courtesy of J. Michael Wenger

Lt. Makino Saburo was shot down by 2nd Lt George Welch flying a P-40. The dive bomber struck a house just outside Wheeler Field. Both Makino and his observer Warrant Officer Sukida Sueo died in the crash.

100 Greatest Battles

By Angus Konstam, Osprey Publishing, UK. 2023. 224 pp. Ill.

A very unusual concept, this book offers descriptions of what the author considers to be history's 100 greatest battles from Marathon 490 B.C. to Desert Storm, 1991. Each two-page entry contains a full-page illustration of a battle scene (no photos), while the second page contains a concise description of the battle. Obviously, it is a unique use of existing "artworks" from Osprey's many other volumes from existing series. The $20 price is very attractive.

A few other examples, some well-known, others not so famous, are: Thermopylae, 480 B.C., Hastings, 1066, Malta, 1565, Quebec, 1759, Waterloo, 1815, the Battle of Britain, 1940, and Dien Bien, Phu, 1954.

For our purposes in this particular column, Pearl Harbor is also included.

The author/editor comes from Orkney, an island off Scotland's north coast and has written more than 100 books, including 75 for Osprey, although he might not be familiar to American readers.

Nonetheless, it is an interesting trip through history and certainly represents a ready reference for armchair historians of many dates, familiar and not so familiar.

Courtesy Osprey Publications

Artist Adam Hook's panoramic view of the overall attack shows the battleship USS Nevada (BB 36) struggling to make it out of the close confines of the harbor and into the open sea to avoid blocking the main channel by sinking. The courageous action was undertaken by then-Ensign, later-Capt. Joseph K. Taussig Jr., Officer of the Deck, who received the Navy Cross.

Thanks to the following people who helped with photos and information for this column:

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