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Cover photo: U.S. Army photo by Brandon Mejia

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Marines crack the surf zone with mine-detection uncrewed vehicles



BY John Keller
EDITOR IN CHIEF

Uncrewed vehicles consistently have proven their worth when it comes to detecting and disabling hidden mines on land and in the water. A variety of floating and submersible uncrewed land vehicles and ocean vehicles are taking the front lines in the war on mines.

While uncrewed ground vehicles (UGVs), uncrewed surface vessels (USVs), and uncrewed underwater vehicles (UUVs) are effective in their respective domains, the areas along the surf zone of beaches — part land, and part ocean — have been a particularly difficult problem for uncrewed vehicles, until now.

The U.S. Marine Corps has an intense focus on the surf zone and on the threats that lurk within the waves for Marine commanders who are moving infantry and their equipment from amphibious ships offshore onto the beach. The surf zone has been an unusually lethal operational area for Marines and soldiers at least for as long as the invasions of Normandy and Iwo Jima during World War II.

The surf zone that involves a mix of land and water is where attacking infantry are at their most vulnerable. They can't avoid moving slowly through the waves and wet sand, and not only must they contend with opposing forces defending the beach, but they also must deal with hidden booby traps located just out of sight in the shallow water.

That's about to change, however, with a Marine Corps \$10 contract awarded this past summer to Greensea Systems Inc. in Richmond, Vt., to develop the Amphibious Unmanned Ground Vehicle (AUGV), as part of the Littoral Explosive Ordnance Neutralization Family of Systems.

The Marine Corps AUGV is to be an uncrewed tracked autonomous crawler that prowls the pounding waves and shifting sands of the surf zone, hunting for hidden mines that threaten the attacking force.

The Marine Corps AUGV is to be based on the Greensea Bayonet series AUGV, which comes in three different sizes with the models 150, 250, and 350. Each size has a different payload capacity and endurance.

The Greensea Bayonet is designed for amphibious surf zone robotics operations, and are built to switch from the ocean into the surf zone and onto the beach, with capabilities for harsh marine environments and heavy payloads.

Key features of Bayonet systems include autonomous operation with the option for tethered or RF link buoy control; high stability and low profile for penetrating waves as high as six feet; long battery life of about six hours of operation between recharging.

The Bayonet series AUGVs consists of the two-person portable 150 for small payloads and light weather and surf conditions, the 250 for harsh conditions and extensive payload requirements, and the 350 for the heaviest payloads harsh conditions. Its standard range is 10 miles submerged and 24 miles dry; a 1.5-knot speed, and high sounding density.

The Bayonet 150 measures 44 by 36 by 10 inches, weighs 290 pounds, has a battery life of 6 hours, and has a deck capacity of 50 pounds. The Bayonet 250 AUGV measures 48 by 48 by 15 inches, weighs 390 pounds, and has a deck capacity of 200 pounds. The Bayonet 350 measures 72 by 60 by 18 inches, weighs 600 pounds, and has a deck capacity of 300 pounds.

On this contract Greensea will do the work in Richmond, Vt., and should be finished by August 2030. For more information contact Greensea Systems online at <https://greenseaiq.com/products/integrated-systems/bayonet-surf-zone-robotics>, or Marine Corps Systems Command at www.marcorsyscom.marines.mil. ◀

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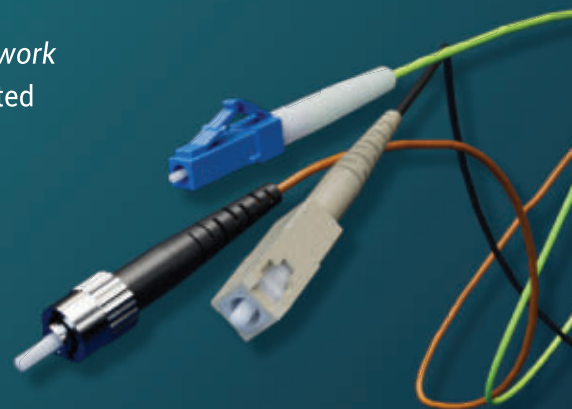
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▲ A U.S. MH-47 Chinook heavy assault helicopter lowers a hoist cable to a combatant craft during a maritime training evolution. Navy photo

Military orders stealthy boats, electronics, for infiltrating and extracting special forces

BY John Keller

MACDILL AIR FORCE BASE, Fla. – U.S. clandestine special forces experts needed technologically advanced stealthy boats for insertion, extraction, and support of Navy SEALs and other special operations units. They found a solution from Fincantieri Marine Group LLC in Washington.

Officials of U.S. Special Operations Command at MacDill Air Force Base, Fla., announced a \$22.1 million contract option to produce the Combatant Craft Heavy V (CCH V) stealthy special operations boats, designed

primarily for use by Naval Special Warfare teams.

The CCH V is the fifth iteration in the Combatant Craft Heavy program, and is known for being among the largest and most technologically advanced boats in the U.S. Special Operations Command. It offers low observability, modularity, and improved capability for high-risk and covert missions, and uses advanced stealth and electronic technologies to evade detection.

Also called the SEAL Insertion, Observation, and Neutralization craft (SEALION), the CCH V is enclosed, semi-submersible, and provides

enhanced crew and operator protection against detection and small arms fire. The boat is 80 feet long, 14.5 feet wide, and 9.5 feet high.

The boat can be transported by C-17 aircraft or sling-loaded by heavy-lift helicopters for deployment. It replaces earlier generations like the Mark V Special Operations Craft.

CCH V has advanced electronics designed for stealth, command, control, intelligence, surveillance, reconnaissance, and modular mission support.

Its main electronic subsystems include command, control, communications, computers, cyber-defense, and



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combat systems (C6ISR); reconnaissance and surveillance sensors; navigation systems; communications equipment; electronic warfare (EW) and passive detection systems; launch and recovery interfaces; and sensor mast systems.

C6ISR electronics enables command and communication with other naval assets, including robust cyber-defense and computer systems. Reconnaissance and surveillance sensors include retractable sensor masts with high-resolution cameras; electronic sensors for surface and underwater surveillance; and Forward Looking Infrared (FLIR) sensors for enhanced night and low-visibility operations.

Communications equipment includes underwater telephones, UHF radios, encrypted low-probability-of-intercept links, and data transmission for joint operations. EW and passive detection

systems detect, classify, and evade enemy radar, while passive electronic and cyber warfare measures improve survivability in contested environments.

Launch and recovery interfaces integrate with uncrewed surface and underwater vehicles, plus specialized payload control systems for munitions and mission packages. Modular masts offer mission-specific sensors for reconnaissance, navigation, or communications. CCH V boats also can accommodate pop-up missile launchers with stand-off munitions.

On this contract option, Fincantieri Marine will do the work in Green Bay, Wis., and should be finished by November 2027. For more information contact Fincantieri Marine Group online at <https://fincantierimarinegroup.com/>, or U.S. Special Operations Command at www.socom.mil. ◀

RTX Collins Aerospace to build 9,859 AN/ARC-210(v) avionics voice and data radios

Military aircraft communications experts at Collins Aerospace in Cedar Rapids, Iowa, will provide the U.S. Navy with thousands of avionics radios under terms of a \$351.2 million order. Officials of the Naval Air Warfare Center Aircraft Division at Patuxent River Naval Air Station, Md., are asking the RTX Corp. Collins Aerospace segment to provide 9,859 AN/ARC-210(v) avionics radios and related equipment. These radios are for installation in more than 400 military aircraft, ships, submarines, land vehicles, and fixed-site applications for the Navy, Marine Corps, Army, Coast Guard, other government agencies and U.S. allies. The ARC-210 radio also includes embedded anti-jam waveforms, including Have Quick and SINCGARS, and other data link and secure communications features for battlefield interoperability and transfer of data, voice, and imagery. The AN/ARC-210 Gen V programmable digital communications system conforms to software-defined radio (SDR) tenets, and transfers networked or point-to-point data, voice, and imagery. For more information contact RTX Collins Aerospace online at www.collinsaerospace.com/what-we-do/industries/military-and-defense/communications/airborne-communications/vhf-uhf-l-band/arc-210-rt-2036-c, or the Naval Air Warfare Center Aircraft Division at www.navair.navy.mil/nawcad. ◀

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FAA launches pilot program to integrate eVTOL and advanced AAM into U.S. skies

BY Jamie Whitney

WASHINGTON—The U.S. Federal Aviation Administration (FAA) in Washington is seeking proposals for a new electric vertical takeoff and landing (eVTOL) and Advanced Air Mobility (AAM) Integration Pilot Program (eIPP) to speed the safe adoption of next-generation aircraft in the National Airspace System (NAS).

The program invites state, local, tribal, and territorial governments to partner with private companies with experience in eVTOL and AAM aircraft or enabling technologies. Proposals must outline operational concepts that

can be tested and scaled nationally, while meeting FAA safety requirements.

The initiative supports Executive Order 14307, issued by President Donald Trump on 6 June 2025, which directed the U.S. Department of Transportation to accelerate commercialization of uncrewed and advanced aviation technologies.

The eIPP is expected to deliver data and lessons learned that will inform future regulatory frameworks for safety, certification, and economic integration of AAM aircraft.

eVTOL aircraft, which are electric-powered systems capable of vertical takeoff, hover, and efficient forward

flight, are seen as a potential game changer for urban air taxis, regional commuter services, cargo transport, and medical or emergency response.

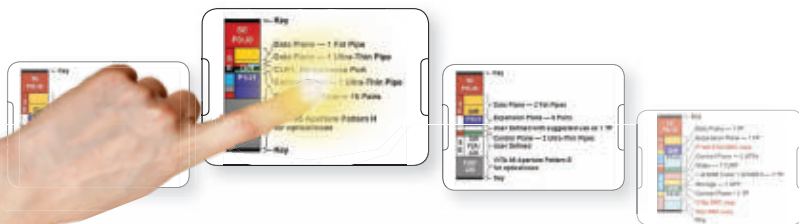
Planned demonstrations could include short-range on-demand flights connecting urban centers to ground transit, regional fixed-wing operations using hybrid AAM aircraft, offshore logistics flights to support energy facilities, and advanced medical transport. Projects may also test automation technologies designed to improve flight safety and efficiency while easing integration into existing airspace.

FAA officials said the new program will differ from the 2017 Drone Integration Pilot Program, which focused on limited geographic trials. Instead, the eIPP will prioritize scalable projects that demonstrate real-world public benefits such as workforce development, supply chain security, and advanced traffic management across multiple jurisdictions.

At least five participants will be selected, each entering into an Other Transaction Agreement (OTA) with the FAA to establish roles, operational concepts, and data-sharing commitments. While each participant will bear its own costs, the data collected will help the FAA evaluate the effects of eVTOL and AAM integration and guide future policy decisions.

The FAA emphasized that safety will remain the top priority, with each project required to incorporate appropriate risk mitigations. Successful demonstrations are expected to accelerate commercial adoption of AAM technologies while showcasing new

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► Archer Aviation's Midnight eVTOL aircraft at San Francisco International Airport. Archer Aviation photo.

applications that could improve U.S. transportation infrastructure and economic competitiveness.

The main point of contact for this program is Kristin Frantz, who can

be reached at Kristin.T.Frantz@faa.gov. All questions must be received no later than 5:00 PM ET on 7 October 2025. Proposals must be submitted through the solicitation on sam.gov

no later than 3 p.m. ET on 11 Dec. 2025. More information is available at <https://sam.gov/workspace/contract/opp/97727114ea0b4c9a9b-a3553a1acf1d0b/view>. ◀

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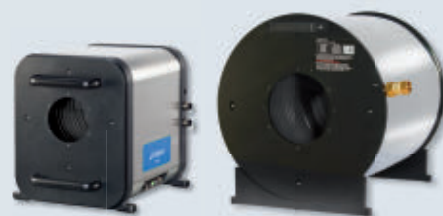
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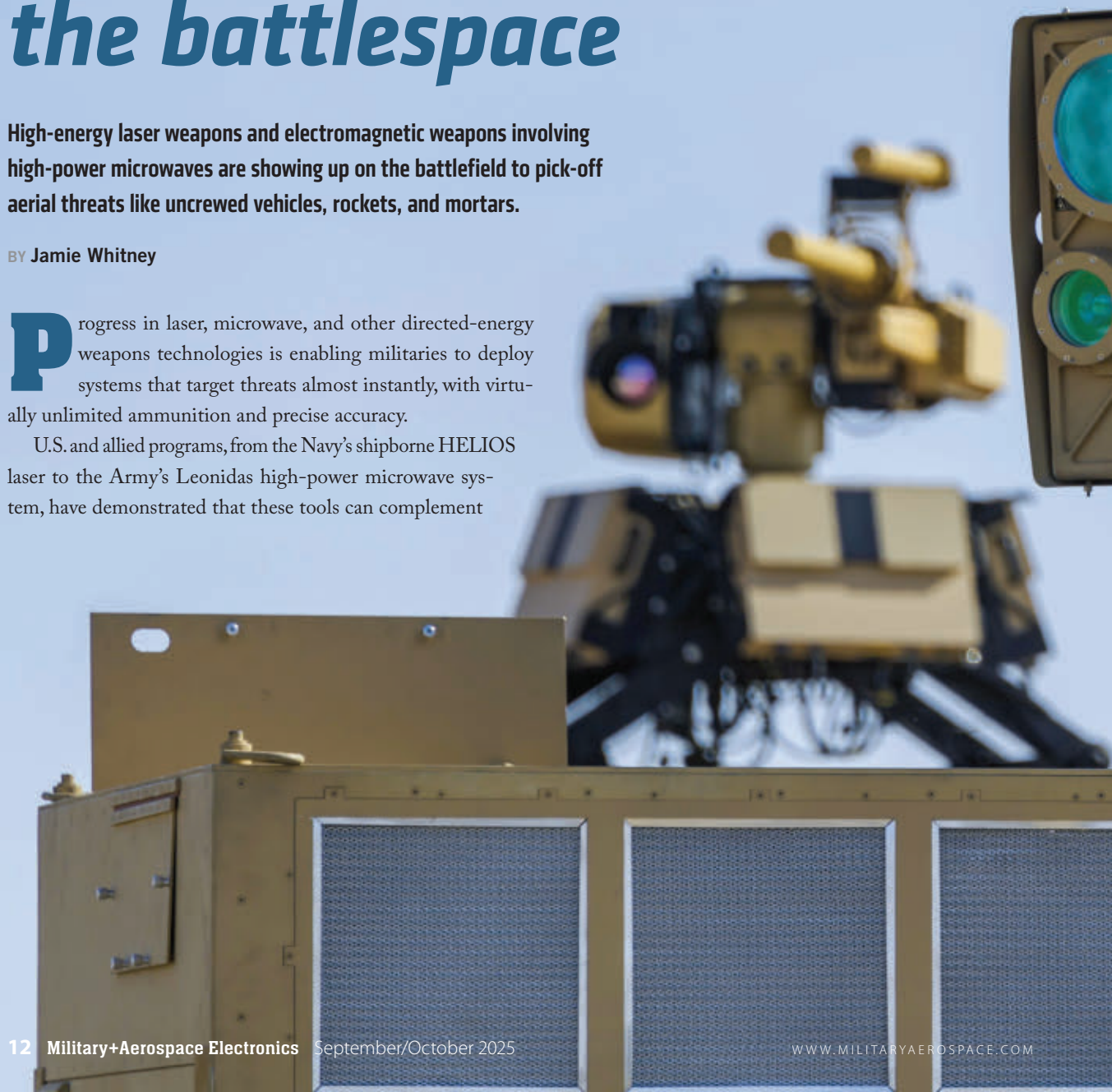
DIRECTED-ENERGY WEAPONS (DEWs) *have left the screen and page and are entering the battlespace*

High-energy laser weapons and electromagnetic weapons involving high-power microwaves are showing up on the battlefield to pick-off aerial threats like uncrewed vehicles, rockets, and mortars.

BY Jamie Whitney

Progress in laser, microwave, and other directed-energy weapons technologies is enabling militaries to deploy systems that target threats almost instantly, with virtually unlimited ammunition and precise accuracy.

U.S. and allied programs, from the Navy's shipborne HELIOS laser to the Army's Leonidas high-power microwave system, have demonstrated that these tools can complement



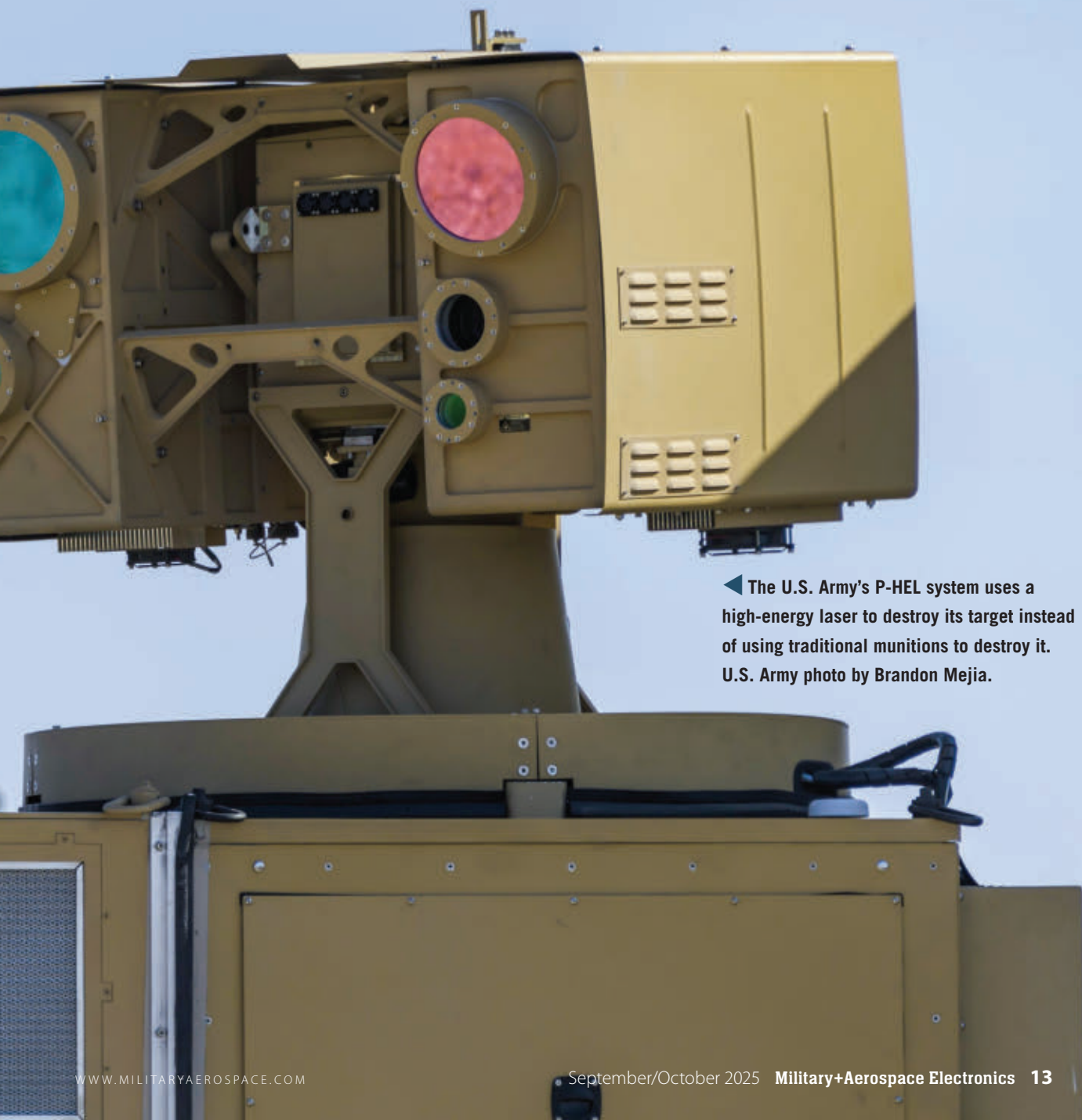
traditional kinetic weapons, offering scalable and cost-effective solutions against drones, missiles, and other threats.

As global powers accelerate development, engineers are addressing challenges in power scaling, beam control, and thermal management while exploring applications for space-based platforms and hardened electronics. Combined with operational testing, these advances position directed-energy systems as an integral component of modern defense, reshaping both strategy and tactics.

The conflict in Ukraine has seen one of the first documented battlefield uses of directed-energy weapons (DEWs). Ukrainian and Russian forces have deployed laser weapons to counter drones, missiles, and other aerial threats, offering an early real-world test of these technologies in a contested environment.

Ukraine has unveiled its domestically developed Tryzub [Trident] laser weapon, capable of engaging uncrewed aerial vehicles, aircraft, and missiles at altitudes higher than 1.2 miles.

Ukrainian forces have used the laser weapon against Russian drones and can burn through aircraft metal in testing, says



◀ The U.S. Army's P-HEL system uses a high-energy laser to destroy its target instead of using traditional munitions to destroy it. U.S. Army photo by Brandon Mejia.

Col. Vadym Sukharevskyi, commander of Ukraine's Uncrewed Systems Forces. Tryzub shows that DEWs can carry out precise, near-instantaneous attacks on several different target types.

Russian forces also have fielded laser weapons in the conflict, including Peresvet and Zadira. Peresvet, deployed since 2019, is intended for sensor and satellite disruption, while Zadira is claimed to destroy aerial targets as far away as 3.2 miles within seconds. Publicly available information on Russian use is limited, though a video in 2025 appears to show a Russian system destroying a drone, marking one of the first confirmed combat engagements using a laser weapon in Ukraine.

These deployments underscore the increasing importance of high-energy laser technology in contemporary warfare. The Ukraine conflict is providing valuable data on the practical challenges of integrating DEWs into military operations, including targeting, power



▲ The DE M-SHORAD integrates a 50-kilowatt class high-energy laser weapon system with the mobility and versatility of the Stryker A1 8x8 armored vehicle.

management, and coordination with traditional kinetic systems.

In ongoing operations in the Israel-Gaza conflict, Israel has fielded operational DEWs against Hamas. The Rafael Advanced Defense Systems Iron Beam system is a 100-kilowatt high-energy laser designed to intercept rockets, mortars, and drones. Unlike missiles, Iron Beam is fueled by electricity, offering significantly lower

cost-per-engagement and near-instantaneous targeting.

The system has demonstrated the ability to engage several aerial threats with precision and speed, even under challenging environmental conditions. In October 2023, a prototype destroyed drones launched from Gaza.

Complementing Iron Beam, Israel has deployed the Light Blade system, which targets smaller threats such as incendiary balloons and quadcopters. Light Blade operates at ranges as far as 1.2 miles and has achieved success in intercepting these low-cost threats.

Directed-energy projects

The U.S. Department of Defense (DOD) is investing in a wide range of directed-energy projects. Programs like the Army's Palletized High Energy Laser (P-HEL) system and the Navy's High-Energy Laser with an Integrated Optical Dazzler and Surveillance (HELIOS) reflect the Pentagon's focus on rapid prototyping and quick deployment.

Both technologies aim to counter swarms of small uncrewed aerial systems and incoming projectiles. Meanwhile, research into airborne and ground-based high-energy microwave systems is



▲ The M-SHORAD system participates in a live-fire exercise at Fort Sill, Okla., to test its ability to counter aerial threats. U.S. Army photo by Jim Kendall.



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expanding the use of non-kinetic effects, enabling forces to disrupt electronics and communications with minimal collateral damage.

Efforts are also underway to integrate DEWs into larger battle networks, connecting sensors, targeting systems, and command-and-control infrastructure. By combining directed-energy platforms with advanced radar, electro-optical, and electronic warfare sensors, operators can detect, track, and engage threats in real time.

As these technologies develop, military planners are exploring operational concepts that harness the speed, precision, and scalability of DEWs to support layered defense strategies — from protecting high-value assets to enabling expeditionary operations in contested environments.

Army efforts

Built for quick, accurate targeting of aerial and ground threats, P-HEL combines high-power laser technology with advanced targeting and beam control. Recent tests have aimed at neutralizing

swarms of small drones and defending against rocket, artillery, and mortar threats, showing the system's potential to enhance traditional defenses and decrease the logistics of using conventional munitions.

During demonstrations, P-HEL effectively engaged several small UAS' at different distances, showing both its precise targeting algorithms and beam stabilization technologies. The system uses modular laser modules that can adjust their output to respond to various threat types, providing a versatile response while managing thermal loads and power requirements. Army officials say P-HEL is designed for near-term integration into existing tactical vehicles and forward operating bases, with ongoing tests evaluating its reliability, maintenance requirements, and compatibility with sensor networks for real-time threat detection.

In February 2024, the Army deployed four Directed Energy Maneuver-Short Range Air Defense (DE M-SHORAD) prototype vehicles overseas, delaying scientific and technical testing originally

planned by the Rapid Capabilities and Critical Technologies Office (RCCTO). During the deployment, the Army Test and Evaluation Command conducted a three-day controlled assessment in June; however, officials noted that the limited data was insufficient for a comprehensive evaluation of the system's effectiveness, lethality, suitability, and survivability. Operational insights are instead being gathered through an ongoing In-Theater Assessment.

The DE M-SHORAD integrates sensors and a 50-kilowatt spectral beam combined laser onto a Stryker Mortar Carrier Double V-Hull A1 armored combat vehicle. Powered by lithium nickel cobalt aluminum oxide (Li-NCA) batteries recharged by onboard diesel generators, the system is designed to counter uncrewed aircraft systems, rockets, artillery, mortars, and rotary- and fixed-wing aircraft. Organized into platoons of four vehicles within short-range air defense battalions, the laser-armed Strykers are intended to complement M-SHORAD vehicles equipped with kinetic weapons such as Stinger missiles and a 30-millimeter cannon.

In June, soldiers from the 4th Battalion, 60th Air Defense Artillery Regiment worked with the Army's Rapid Capabilities and Critical Technologies Office (RCCTO) to conduct a live-fire exercise pairing DE M-SHORAD with traditional kinetic platforms at Fort Sill, Okla. The event focused on defeating swarms of Group 1-3 uncrewed aircraft systems while exploring how lasers and missiles can function together in a layered defense. The exercise provided key data to guide future development and procurement, particularly the Army's 2026 Enduring High Energy Laser program, expected to become the first DE program of record.



▲ An artist rendering of the Air Force Research Laboratory's Tactical High-power Operational Responder, or THOR. The technology is a portable counter-UAS system, capable of destroying swarms of drones at long range. Air Force image.



▲ The Arleigh Burke-class destroyer USS Preble (DDG 88) arrives in port in Yokosuka, Japan, in October 2024. The USS Preble is a part of the Navy's U.S. 7th Fleet's principal surface force. The Arleigh Burke-class destroyer is outfitted with the Navy's HELIOS system, which engaged an aerial drone at sea, according to the DOD's DOT&E.

The Fort Sill test also allowed soldiers to practice refined tactics, techniques, and procedures for integrating lasers into air defense operations, including threat prioritization, identification protocols, and engagements under varying environmental conditions.

High-power microwaves

Alongside its high-energy laser initiatives, the U.S. Army is investing in electromagnetic weapons that include high-power microwave (HPM) systems to counter emerging aerial threats. One of the more prominent efforts is the Leonidas program, an electromagnetic weapon developed by Epirus Inc. in Torrance, Calif. Designed as a counter-uncrewed aircraft system (C-UAS), Leonidas delivers pulsed bursts of electromagnetic energy to

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disable or destroy the electronics inside drones and other airborne threats without the need for kinetic interceptors.

The system is built around solid-state, software-defined HPM technology that enables operators to tailor its effects against swarms of targets in real time. Unlike traditional jamming systems that rely on brute-force broadcasting across frequency bands, Leonidas uses precision-targeted waveforms to create localized, high-intensity electromagnetic effects. This approach is intended to minimize collateral impact on friendly systems while enabling scalable power output for different operational environments.

The RCCTO has tested Leonidas in live-fire events to demonstrate how it fits within a layered defense. In 2024, the system was evaluated against Groups 1 through 3 uncrewed aircraft in swarming attack profiles, with the goal of validating its ability to neutralize several threats simultaneously. According to Army officials, the technology is being integrated onto tactical vehicles to assess mobility,

survivability, and interoperability with command and control systems.

Navy power

The Navy's High Energy Laser and Integrated Optical-dazzler with Surveillance (HELIOS) program aims to provide shipboard defense against drones, small boats, and aerial threats. Developed by Lockheed Martin in Bethesda, Md., HELIOS features a modular high-power laser integrated with shipboard radar, electro-optical sensors, and fire-control systems. Testing has included live-fire evaluations aboard vessels to validate targeting software, beam control, and thermal management.

According to the Department of Defense's Director, Operational Test and Evaluation (DOT&E) reports, HELIOS testing continues to evaluate system performance in realistic maritime conditions, focusing on reliability, integration with shipboard combat systems, and effectiveness against several uncrewed threats simultaneously.

Beyond terra firmThe U.S. Air Force is advancing its own directed-energy portfolio through efforts like the Tactical High Power Operational Responder (THOR), a counter-drone system developed by the Air Force Research Laboratory (AFRL) at Kirtland Air Force Base, N.M.

THOR uses high-power micro-waves to disable or destroy the electronics inside small UAS, providing a fast, non-kinetic option for base defense. Housed in a standard shipping container and designed for rapid deployment, THOR can be transported aboard a C-130 aircraft and can be set up in less than three hours. The system's wide-beam emission allows operators to engage swarms of drones simultaneously.

Beyond tactical systems, the Air Force and the U.S. Space Force are exploring how directed energy could support future space control missions. AFRL's Directed Energy Directorate has conducted studies on ground-based lasers for satellite dazzling, advanced imaging, and orbital



defense applications. These efforts are tied to broader research on power scaling, beam control, and atmospheric propagation that would be required for any potential space-based laser or microwave platform.

While much of this work remains at the modeling and feasibility stage, AFRL and the Defense Advanced Research Projects Agency (DARPA) have examined megawatt-class space power systems and lightweight optics as enablers of orbital directed energy capabilities. The long-term vision is to develop tools that can protect satellites, deny adversary space capabilities, and integrate directed energy into layered space security architectures.

Allied efforts

The United Kingdom (UK) also is advancing its directed-energy portfolio through the DragonFire laser-directed energy weapon (LDEW) program. In a recent trial at the Ministry of Defence's (MOD) Hebrides Range, the system

achieved the nation's first high-power laser firing against aerial targets, marking a step toward the UK fielding the technology in the future. While the exact range remains classified, DragonFire is a line-of-sight weapon capable of engaging any visible target, with the precision

"equivalent to hitting a £1 coin from a kilometer away," according to program officials.

Led by the Defence Science and Technology Laboratory (DSTL) on behalf of the MOD, with industry partners MBDA in Le Plessis-Robinson,



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◀ The Sodium Guidestar at the Air Force Research Laboratory Directed Energy Directorate's Starfire Optical Range. Researchers with AFRL use the Guidestar laser for real-time, high-fidelity tracking and imaging of satellites too faint for conventional adaptive optical imaging systems. Air Force photo.

France, Leonardo in Rome, and QinetiQ in Farnborough, UK, DragonFire is the product of a £100 million joint investment. Its design emphasizes both accuracy and affordability, with each shot costing less than £10 — what officials describe as the energy equivalent of running a household heater for an hour.

“This type of cutting-edge weaponry has the potential to revolutionize the battlespace by reducing the reliance on expensive ammunition, while also lowering the risk of collateral damage,” said Defence Secretary Grant Shapps. Dstl Chief Executive Dr. Paul Hollinshead added that the trials represent “a huge step forward in realizing the potential opportunities and understanding the threats posed by directed energy weapons.”

The British Army and Royal Navy are considering DragonFire for integration into future air defense architectures, building on MOD-backed research that began with a 30 million-pound contract in 2017. Officials emphasize that accelerating the transition from the laboratory to operational service will be a priority in the next phase of development.

Testing needs

While U.S. military branches have “ready for primetime” systems at their disposal, testing DEWs comes with its fair share of headaches. The DOT&E is the DOD’s office responsible for independently assessing whether new military systems perform as intended in realistic operational conditions.

DOT&E oversees operational testing, evaluates effectiveness, suitability, and survivability, and reports findings to Congress to support acquisition decisions. The office focuses on ensuring that weapons, platforms, and technologies — ranging from aircraft

and ships to integrated air and missile defense systems — can operate reliably alongside existing capabilities, providing an independent check that helps mitigate risk and ensure warfighters receive systems that are both effective and safe.

Earlier this year, DOT&E noted in its annual report that the DOD currently lacks the infrastructure to test high-energy lasers and other directed energy weapons under realistic operational conditions. Existing facilities — including the Army’s White Sands Missile Range — are limited to single-system tests and cannot support integrated, multidomain evaluations of air, land, and sea platforms. Range constraints, safety requirements, and cost limitations further restrict the amount of live testing that is practical.

DOT&E reported that key gaps include a shortage of credible threat surrogates for anti-ship missiles, drone swarms, and other peer-level systems, as well as insufficient instrumentation to capture radar, infrared, and electromagnetic signatures needed to assess performance and validate models. The inconsistent collection of time, space, and position information across platforms complicates post-test analysis and makes it difficult to reconstruct engagement results.

The evaluation office says that DOD increasingly relies on modeling and simulation, including Open-Air Battle Shaping (OABS), to simulate mission-level engagements. While these tools help fill gaps, their fidelity depends on improvements in instrumentation, network connectivity, and expanded threat representation.

DOT&E stresses that fully evaluating directed energy systems requires sustained investment in test range modernization, DE-specific safety equipment, high-fidelity threat surrogates,

and a skilled test and evaluation workforce capable of handling emerging technologies such as lasers, high-power microwaves, and electromagnetic warfare systems.

“The electromagnetic operating environment (EMOE) is increasingly congested and contested by military and civilian systems and constrained by national and international regulations. In addition, modern software-defined EMS-dependent systems can rapidly change their operating characteristics,” DOT&E said in its annual report. “Future adversary EMS dependent systems will include complex, autonomous behavior (incorporating AI to varying degrees) that will adapt to changing environments as the systems learn.

The report continues, “The inability to represent modern radars affects T&E of EW systems and their associated combat systems and platforms. Emulating the closed-loop tracking capabilities of modern threat radars, including software-defined radars, remains a shortfall. This shortfall critically affects the ability to conduct adequate operational testing of our Electronic Attack (EA) capabilities. Additionally, it affects the ability the test EA capabilities to support their host platforms’ mission. Most of the radar emulation capabilities on the test ranges and in laboratory facilities emulate only the open-loop signal emissions of threats, and not the sophisticated back-end processing, including electromagnetic protection logic, that these radars employ. Other key EMS-related shortfalls are focused on our emulation of threat electromagnetic attack systems. For example, the current set of anti-ship missile surrogate (aerial target) payloads do not sufficiently represent foreign electromagnetic attack systems for use in testing a program’s



▲ Sandra Fries-Carr analyzes the diamond-like carbon film deposited on foil in the Air Force Research Laboratory propulsion directorate's power division. Air Force photo.

electromagnetic protection. While the Navy has improved their ability to represent such threats, advancements in these capabilities have not yet been fully integrated into aerial targets. This issue affects all variants of shipboard air and missile defense systems, and host platforms. Another key shortfall is in the ability to conduct frequent and simultaneous GPS jamming and spoofing across several test ranges, at times due to FAA regulations.”

Near-peer developments

China's military research community is reporting progress on a new class of HPM weapons designed to disable or destroy the electronics inside adversary systems. Stephen Chen originally reported the development for the South China Morning Post, citing a peer-reviewed

study in High Power Laser and Particle Beams by scientists from the National University of Defence Technology in Changsha and the Northwest Institute of Nuclear Technology in Xian.

Unlike traditional HPM systems, which rely on rotating dish antennas to target threats, the Chinese design employs phased-array transmission to focus energy more precisely. Researchers claim this approach not only extends the weapon's effective range but also allows simultaneous engagement of several targets. One of the reported breakthroughs is an eight-way power divider that maintained stable output during more than 5,000 full-power emissions, operating at efficiency levels above 96 percent.

The electromagnetic waves generated by the system reportedly reach power levels of nearly one gigawatt, with electric

field strengths comparable to those of nuclear-induced electromagnetic pulses. Testing also demonstrated the ability to emit in the Ku-band, the same frequency range used by commercial satellite constellations such as SpaceX's Starlink communications technology. Some Chinese experts note that the reliance on commercial-grade components in these constellations could leave them vulnerable to such directed-energy attacks.

The research underscores Beijing's interest in anti-satellite and counter-space capabilities. With Starlink's role in supporting Ukrainian defense against Russia, Chinese analysts suggest that gigawatt-class HPM systems could be developed as tools for targeting drones and satellites in low-Earth orbit, raising the prospect of new challenges in space and electronic warfare. ◀

Military embedded computing: standard vs. non-standard

The Pentagon's imperative to get technology out to the field as soon as possible sparks a debate on when designers should use standards, and when they shouldn't.

BY John Keller

Those involved in the embedded computing industry today face a paradox of sorts: demands from the Pentagon and from the defense industry to move commercially developed technology to the field as quickly as possible, while at the same time specifying open-systems standards, which can be notorious for moving slowly.

Talk about open-systems embedded computing standards like the Sensor Open Systems Architecture (SOSA) and the Modular Open Systems Approach (MOSA), and often the first thing people think of is the time necessary to learn the ins and outs of these guidelines, and also the time it takes to certify compliance. Quick-turnaround technology rarely enters the conversation ... at least at first.

As it turns out, standards-based embedded computing actually may be nimble enough for all but the most stringent demands to get systems developed and out to the field no later than yesterday. As today's open-systems standards evolve — and as technology providers and systems designers become familiar and comfortable with them — it's dawning on the industry that the standards

approach might not be as slow as first thought, and that over the long term, standards are the way to go for rapid technology development, sustainment, and upgrades.

Influence of the Ukraine war

Military electronic technology for decades has moved at a snail's pace from development to fielding, and that's been considered the norm — until only recently. The Ukraine-Russia war has demonstrated conclusively that military electronics can be developed and deployed quickly and effectively on a shoestring budget.

"We are seeing a war being prosecuted with stuff found in the garage and

on the shelves at Wall Mart," points out Chris Ciufu, president and chief technology officer at embedded computing specialist General Micro Systems Inc. (GMS) in Rancho Cucamonga, Calif. "In Ukraine we have seen breathtaking use of technology, their ability to modify it, and their creative doctrine on the battlefield."

Ciufu says he's astonished at how quickly and effectively that designers in Ukraine can capitalize on inexpensive technologies. "Look at their drone swarm," Ciufu says. "Their most effective attack was with camouflaged recreational vehicles launching their drones, and bombing aircraft on an airfield. We



► The VPX3-536 from Curtiss-Wright Defense Solutions is a rugged, high-performance adaptable real-time processing board featuring an AMD Versal Premium VP2502 with AI cores and high-density fiber optic backplane I/O.

saw their drone swarms armed with electronic single-munitions and a backup technology with a fiber optic link.”

He says these Ukrainian attack drones cost about \$8,000 apiece. “The companies that make drones in this country ... these are not \$8,000 machines; these are millions of dollars machines. This is low-cost technology being used by both sides to great effect. We have talked about asymmetric warfare before, but now it is an order of magnitude advanced from that. It’s every bit as sophisticated as what the U.S. is deploying today.”

Standard vs. non-standard

“The U.S. Department of Defense has awakened to this, and the government now is looking at non-standard technologies and companies that might be brought to bear on these problems,” says GMS’s Ciufu. “The government wants to partner with Silicon Valley companies

to bring their technologies onto the battlefield quickly and cheaply. They want to find the technology that solves the need, and apply it.”

As an example, Ciufu cites the U.S. Army’s Soldier-Borne Mission Command (SBMC) next-generation digital awareness and mission command

system designed for company-level and below infantry operations. It seeks to integrate augmented reality, night vision, and artificial intelligence (AI) into soldier-worn headsets and systems.

The SBMC is the latest iteration of the Army’s Integrated Visual Augmentation System (IVAS), which



▲ The Elma portable FlexVNX+ development chassis accelerates development and testing of both VITA 90 and SOSA aligned VNX+ plug-in cards.

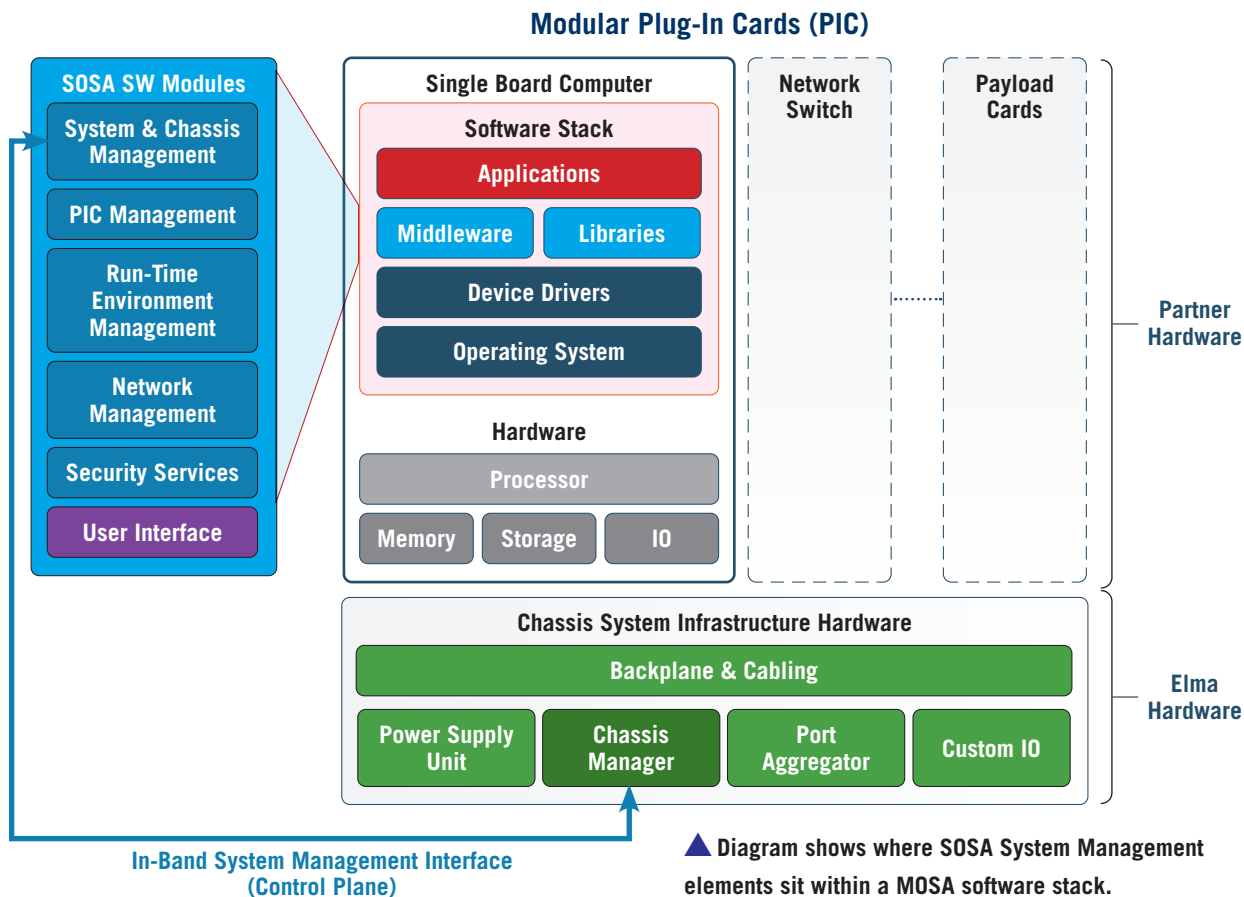


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originally was a \$22 billion contract to Microsoft. IVAS didn't succeed because of user acceptance issues, significant technical flaws, and persistent physical discomfort of soldiers during testing.

The IVAS contract management moved earlier this year from Microsoft to Anduril Industries in Costa Mesa, Calif. Anduril and Rivet Industries in Washington now are the SBMC prime contractors, and seek to develop a next-generation situational awareness and mission command system that integrates data from soldiers, sensors, and mission systems.

For its part, Anduril is partnering with Meta in Menlo Park, Calif. — parent company of Facebook — to develop advanced augmented reality and mixed reality devices for U.S. soldiers. Together, the companies are

building augmented-reality products like helmet-mounted displays that offer enhanced vision, night vision, thermal imaging, and real-time battlefield intelligence. This partnership takes advantage of Meta's augmented and virtual reality research and combining it with Anduril's Lattice command and control software. The Army awarded The Rivet and Anduril teams separate \$195 million contracts on 4 Sept. 2025 for the SBMC.

The point is that the contracts to Anduril and Rivet "are less than one-tenth of what the Army were predicting to spend with a different vendor," Ciufu says. "Non-traditional vendor partnering with the DOD will change our marketplace."

Even advocates of standards-based embedded computing design acknowledge that non-standard technology

may be the best choice — especially when a system isn't expected to stay in use for long,

"There is a balance there, in just doing it all in a proprietary way, versus trying to work within the standards mechanisms we have today," says Ken Grob, director of embedded technologies at Elma Electronic in Fremont, Calif. "There is overhead going both ways, yet one can have a better ecosystem by going through the standards, but there are challenges that not even the standards can keep up with. Anything that needs to be deployed next month won't be able to go through the open-standards approach."

Benefits of open-systems standards

Despite its reputation for being a slow mover, standards-based embedded

computing design over the past few years has shown itself to be fast, resilient, and a driver for quick systems design and technology insertion. Of particular influence has been the Modular Open Systems Approach (MOSA) — not itself a standard, but an integrated business and technical strategy primarily in use at the DOD competitive, affordable, and adaptable systems acquisition and sustainment throughout the system life cycle.

MOSA employs open-systems standards like SOSA to build systems that are loosely coupled and composed of interoperable modules with designated interfaces. This approach enables independent acquisition of modules from different vendors, while reducing life cycle costs and risks. MOSA enables incremental capability upgrades, promotes reuse of assets, and supports faster

technology integration in defense systems. It also requires an open business model emphasizing transparency and collaboration across the defense enterprise.

“We have the mandate from the government to follow the MOSA approach, so SOSA becomes a standard that adheres to the MOSA approach,” says Elma’s Grob. Over the past three to five years we have had people pick it up and

use it, and we’re seeing they are having less issues with initial hardware integration. A few years back you could not take a card from one manufacturer and bring it into another manufacturers slot and not have problems with I/O.”

The MOSA approach offers guidelines to map I/O and power schemes, as well as thermal management. “Initially it has saved people a bunch of time



◀ **Atrenne** specializes in custom embedded computing systems and components primarily serving aerospace, defense, computing, and telecommunications industries.

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in specifying what they want, and to match that board to a backplane profile,” Grob says. “It will turn on, and it will work.”

The benefits of open-systems embedded computing don’t end there. “Open-systems standards are a strategic imperative, not just a technical requirement,” says Wayne Silvia, principal mechanical engineer at Atrenne Computing Solutions LLC in Brockton, Mass. Atrenne specializes in industrial embedded and rugged computing solutions for mission-critical applications.

“The most influential standards are those that champion modularity, interoperability, and long-term sustainability for mission-critical applications,” Silvia says. “These standards translate directly into tangible benefits for customers, including reduced development time and cost, mitigation of obsolescence, and enhanced interoperability.”

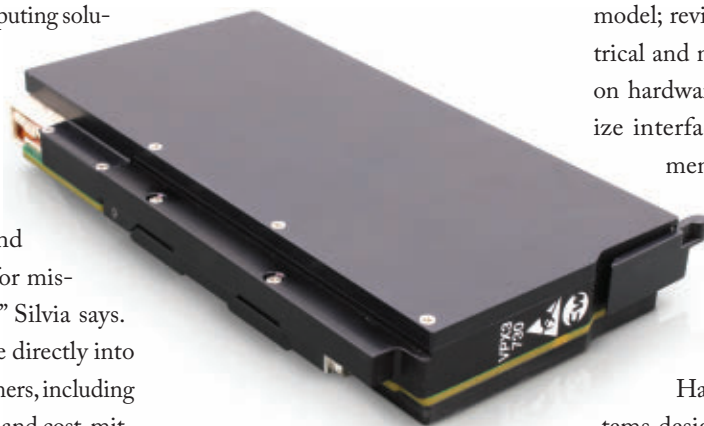
Standards for embedded computing

Among the most influential emerging open-systems standards for embedded computing are VITA 90, also known as VNX+; VITA 100 that could add a new 4U high-performance embedded computing board form factor; and the evolving Sensor Open Systems Architecture (SOSA) standard.

VITA 90 VNX+ is an evolving standard for extremely small embedded computing boards for applications like rugged, space-constrained environments such as uncrewed aerial vehicles (UAVs), ground vehicles, satellites, and C4ISR pods. VNX+ is to be the successor to the earlier VITA 74 (VNX) specification.

The emerging VITA 100 standard, expected to be ratified in early 2026,

has the potential to double I/O board and backplane connector speeds over OpenVPX, breathe new life into 3U and 6U embedded computing architectures, and add a new 4U standard board size to accommodate the relatively large sizes of state-of-the-art microprocessors, field-programmable gate arrays (FPGAs), general-purpose graphics processing units (GPGPUs), and other high-performance components.



▲ **The rugged SOSA-aligned Curtiss-Wright VPX3-730 high-performance embedded computing (HPEC) GPU card combines an NVIDIA RTX PRO Blackwell-generation GPU and ConnectX-7 SmartNIC for 100 Gigabit Ethernet and PCI Express Gen 4/5 connectivity.**

VITA 100 is an evolution to OpenVPX, VPX, and related mechanical standards while embracing a shift in technology and capability with at least double the pin density, speed, and power for electrical contacts. Some of the first VITA 100-compliant products are expected in late 2026 or early 2027. VITA 100 will use the typical 3U and 6U size board formats, but a 4U size also may be implemented to accommodate advanced embedded computing processors and other components that might not fit on 3U VPX cards.

The latest development in the Sensor Open Systems Architecture (SOSA) standard is the release of the Technical Standard for SOSA Reference Architecture, Edition 2.0, Snapshot 3, announced by The Open Group SOSA Consortium last June. This snapshot includes significant updates and new features for inclusion in Edition 2.0 of the standard upon its official release.

Key updates in Snapshot 3 are improvements to the SOSA data model; revision and separation of electrical and mechanical sections; content on hardware acceleration to standardize interfaces; updates and improvements to hardware sections for 3U and 6U board formats; and updates to container language.

The road forward

Have embedded computing systems designers anything to fear from new and emerging standards? Probably not. “In the past we talked about sensor processing in a box with six single-board computers and a network switch to hold it all together. Now we might want to do sensor processing with three boards with an AI approach. It’s just a different mix of components, and that’s not different from what we have been doing for a long time,” says David Jedynak, vice president of strategy for defense solutions at the Curtiss-Wright Corp. Defense Solutions segment in Ashburn, Va.

“There will be lots of new, but it doesn’t disrupt the way we have been approaching this market,” Jedynak says. “There doesn’t need to be a standard for an AI card. It is the very fact of open standards that we can do that. It seeks to draw the appropriate lines between the components, such that lots of innovation can occur in the black boxes, and keep the interfaces among them the same.” ◀



◀ Researchers will investigate how to use power-hungry machine learning in computing in the electricity-starved environment of the battlefield.

USMC Photo

Researchers eye energy-efficient approaches to power-hungry machine learning on the battlefield

BY John Keller

ARLINGTON, Va. – U.S. military researchers are preparing a new program to develop energy-efficient machine learning capabilities for use in austere environments on the leading edge of the battlefield.

Officials of the U.S. Defense Advanced Research Projects Agency (DARPA) in Arlington, Va., have issued a special notice (DARPA-SN-25-101) to inform industry of the forthcoming

Mapping Machine Learning to Physics (ML2P) program.

ML2P seeks to develop an innovative, sustainable approach to power-hungry battlefield machine learning that does not hog the limited electricity on the battlefield that typically comes from batteries and generators.

Machine learning technology today uses an inordinate amount of electricity, which could overwhelm current power generation and storage capabilities on the

battlefield. The ML2P program seeks to make machine learning technologies that energy-efficient enough for the limited resources of the battlefield.

To sustain innovation without compromising energy resources, the ML2P program seeks to develop an innovative and sustainable approach to machine learning.

Machine learning at the edge operates in a resource-constrained battlefield, which requires electrical efficiency. The

solution could involve new generations energy-aware machine learning.

The ML2P program seeks to enable accurate predictions of the power and performance of future machine learning models that understand power consumption throughout the machine learning life cycle. This will drive development

of more energy-efficient military computing, researchers say. ML2P will build energy-aware machine learning that provides trade-offs between power and performance to enable energy-aware machine learning.

DARPA has not officially begun the ML2P program. This announcement

only is to announce the agency's intentions about a future project. Companies that would like to make their interest known should email DARPA no later than 5 Sept. 2025 at ML2P@darpa.mil. More information is online at <https://sam.gov/opp/c6233393d88d450ebf942f87430516fe/view>. ◀

L3Harris to build height-sensing radar proximity sensor for precise attacks on enemy targets

BY John Keller

HILL AIR FORCE BASE, Utah – Airborne weapons experts at L3Harris Technologies Inc. will design and build an avionics radar proximity sensor to enable combat aircraft pilots to set

the heights at which their bombs and smart munitions explode over targets under terms of a \$29.3 million U.S. Air Force order.

Officials of the Air Force Life Cycle Management Center at Hill Air Force Base, Utah, are asking the L3Harris C5

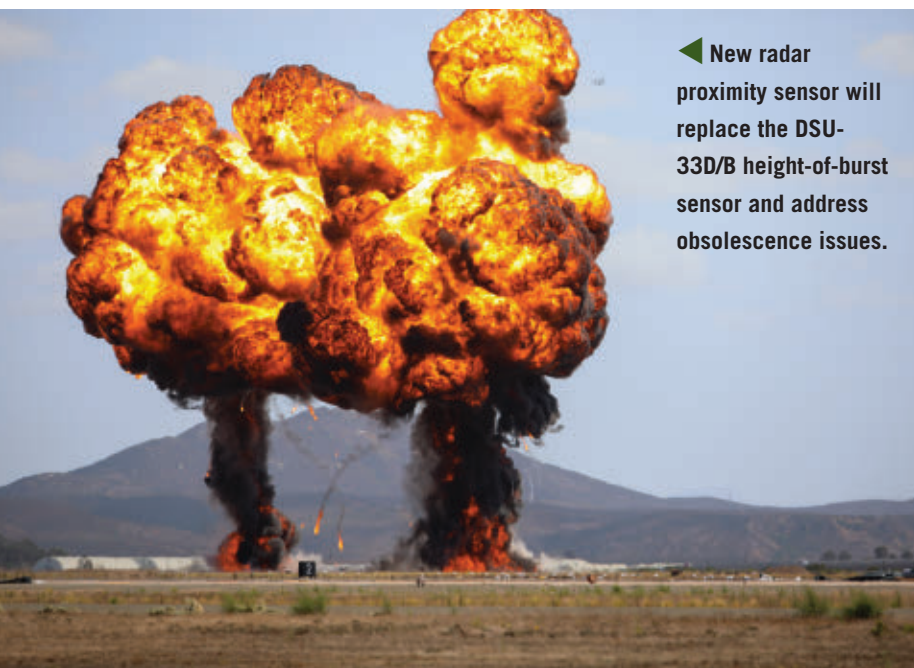
Integrated Systems segment in Camden, N.J., to build the Cockpit-Selectable Height-of-Burst Sensor (C-HOBS).

This avionics subsystem will replace the now-fielded Northrop Grumman DSU-33D/B height-of-burst sensor, as well as address obsolescence issues. Northrop Grumman has been building the DSU-33D/B sensor since 1999.

C-HOBS is a radar proximity sensor that provides a precise variable proximity function to the fuze system. The sensor provides manual and cockpit-selectable heights of burst, precision height sensing, and possible terrain discrimination. The sensor will interface with weapons systems like the Joint Direct Attack Munition (JDAM) the on U.S. Navy and Air Force bomber aircraft.

Upgrades of the C-HOBS program include manual and cockpit-selectable radar-guided height-of-burst with improved system performance for JDAM and the Next Generation Area Attack Weapons (NGAAW) missions, Air Force officials say. L3Harris is expected to build as many as 60,000 C-HOBS units.

On this order L3Harris will do the work in Cincinnati, and should be finished by August 2029. For more information contact L3Harris online at www.l3harris.com, or the Air Force Life Cycle Management Center at www.afllcmc.af.mil. ◀



◀ **New radar proximity sensor will replace the DSU-33D/B height-of-burst sensor and address obsolescence issues.**

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L3Harris to provide tactical networking to coordinate shipboard sensors and weapons

U.S. Navy anti-air warfare are asking L3Harris Technologies Inc. to build tactical networking for sensors and weapons on Navy surface warships and carrier-based aircraft under terms of a \$28.9 million order. Officials of the Naval Sea Systems Command in Washington are asking L3Harris in Camden, N.J., to provide installations and spare parts for the AN/USG-2B system for the Navy Cooperative Engagement Capability (CEC) program. The CEC is a tactical sensor and weapons network that uses Navy ships and aircraft for anti-air warfare. It combines information from sensors operating over wide geographic areas in a common tactical picture for battle groups at sea. It improves overall situational awareness, and enables fleet commanders to work closely together to attack enemy forces from long ranges. This order includes work for Canada. The AN/USG-3 is the airborne designation of CEC deployed in E-2C and E-2D carrier-based radar surveillance aircraft. Other CEC terminals are aboard Navy surface warships; U.S. Marine Corps command posts, aviation command-and-control centers, and surveillance aerostats. The AN/USG-2 for Navy surface warships — also known as the Cooperative Engagement Transmission Processing Set (CETPS) — coordinates all task force anti-air warfare sensors into one real-time, fire-control-quality composite track picture by distributing sensor data from each cooperating unit to all other cooperating units via a real time line of sight fire control sensor and engagement data distribution network.

On this order L3Harris will do the work in Largo, Fla.; Menlo Park, Calif.; Lititz, Pa.; and Menlo Park, Calif., and should be finished by August 2026. For more information contact L3Harris Technologies online at www.l3harris.com, or Naval Sea Systems Command at www.navsea.navy.mil.

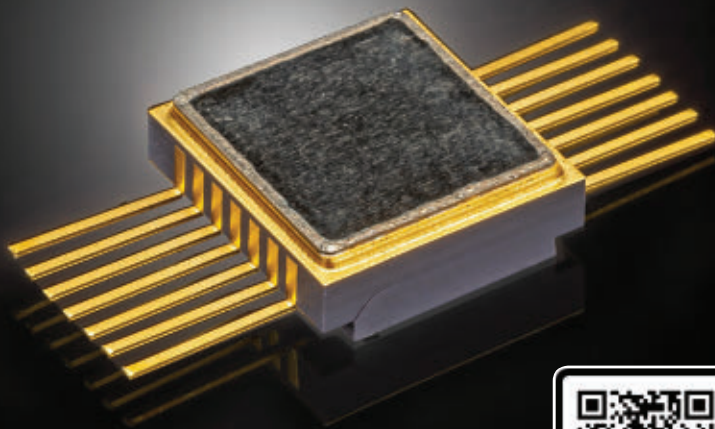
Software-defined radio electronic warfare (EW) to detect improvised explosives offered by Allen-Vanguard

Allen-Vanguard Ltd. in Ottawa is introducing enhancements to the company's RF multi-function cyber and electromagnetic activities (CEMA) system on module to counter RF-enabled threats like unmanned aircraft and improvised explosives. The enhanced CEMA electronic system-on-module

capitalizes on analog signal processing electronic warfare (EW) technology, developed for the Allen-Vanguard future program of systems called the NXT family. It delivers a mixed-signal front-end technology and RF processing in RF threat detect and defeat capability. This technology enables direct RF sampling without the use of tuners across the RF spectrum used by hostile unmanned aerial vehicles (UAVs) and radio-controlled roadside bombs. This technology, based on software-defined radio for EW detect-and-defeat applications, comprises of an RF system on module (SOM) and a customizable product-specific application interface card to detect, protect, and defeat a wide range of threats. For more information contact Allen-Vanguard online at www.allenvanguard.com.

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Two companies seek to improve security for “weird” covert intelligence communications

BY John Keller

ARLINGTON, Va. – U.S. military researchers are hiring two technology companies to improve the security and capabilities of covert hidden communications networks for military and intelligence applications.

Officials of the U.S. Defense Advanced Research Projects Agency (DARPA) in Arlington, Va., have named two companies for the Provably Weird Network Deployment and Detection (PWND2) program.

The companies are Stealth Software Technologies Inc. in Los Angeles, and SRI International in Menlo Park, Calif.

Stealth Software won a \$3.8 million contract and SRI won a \$3.6 million contract.

PWND2 will develop models and tools to improve the deployment and detection of hidden communication networks — also known as weird networks — for military and intelligence use.

Hidden communication systems are essential to national security, yet their design approaches are inadequate today, with no guarantees that users will remain hidden, DARPA researchers say.

Hidden communication systems, often referred to as covert channels, transmit information secretly without detection for stealth and privacy beyond

simple encryption. They are designed to conceal that any communication is occurring.

The current approach is slow and uncertain, and provides only temporary advantages, researchers say. Furthermore, hidden communications networks are expensive to test and validate. Instead, PWND2 is asking Stealth Software and SRI to model weird networks to improve how to deploy and detect hidden networks in the real world.

The project asks Stealth Software and SRI to test how software-defined networking pairs with formal methods to provide provable privacy and

performance guarantees for hidden communication systems at meaningful scale.

A weird network enables emergent unintended communications outside the original specification of a network, and can represent any form of hidden or confusing communications — including an application running over the weird network; the actual weird network; the underlying traditional network that the weird network emerged from; and the capabilities of the adversary.

Stealth Software and SRI experts will create a new domain-specific language

and analysis tools to verify weird network performance, scalability, security, and privacy.

The companies will develop a domain-specific language able to model emergent hidden communications; and develop analysis tools to examine hidden communications systems. For more information contact Stealth Software Technologies online at www.stealth-softwareinc.com, SRI International at www.sri.com, or DARPA at www.darpa.mil/research/programs/provably-weird-network. ◀

Navy picks Sierra Nevada Corp. for precision approach and landing system radar beacons on aircraft carriers

U.S. Navy air traffic control experts needed radar beacons to help Navy aircraft carrier pilots locate and land safely aboard their ships while deployed at sea. They found a solution from Sierra Nevada Corp. in Sparks, Nev. Officials of the Naval Air Warfare Center Aircraft Division in Lakehurst, N.J., announced a \$45.5 million contract to Sierra Nevada for 160 AN/APN-246 beacons in aircraft carrier precision approach and landing systems upgrades. The Sierra Nevada AN/APN-246 automatic carrier landing system radar beacons are the primary airborne components of the precision approach landing system (PALS) aboard Navy aircraft carrier. This is an automated, all-weather approach landing aid for carrier aircraft. The AN/APN-246 is an updated functional replacement for the AN/APN-245, with added features. The automatic carrier landing system radar

beacon enables at-range acquisition and precision guidance of aircraft to the carrier deck in all-weather conditions. The AN/APN-246 integrates into existing F/A-18E/F/G aircraft and can be integrated into other carrier aircraft like the E-2D and crewed and uncrewed aircraft. It supports efforts to add future capabilities as the need arises. The AN/APN-246 Ka band receiver measures 9.5 by 7.5 by 3 inches, weights seven pounds, and takes 69 average Watts of power. The system's X-band transmitter measures 7.5 by 7 by 3 inches, weighs six pounds, and takes 39 average Watts of power. The AN/APN-246 supports dual channel aircraft tracking of the SPN-46 radar; has integrated power-on, and offers continuous built-in-test (BIT). On this contract Sierra Nevada will do the work in Sparks, Nev., and should be finished by August 2027. For more information contact Sierra Nevada Corp. online at www.sncorp.com, or the Naval Air Warfare Center Aircraft Division-Lakehurst at www.navair.navy.mil/lakehurst. ◀



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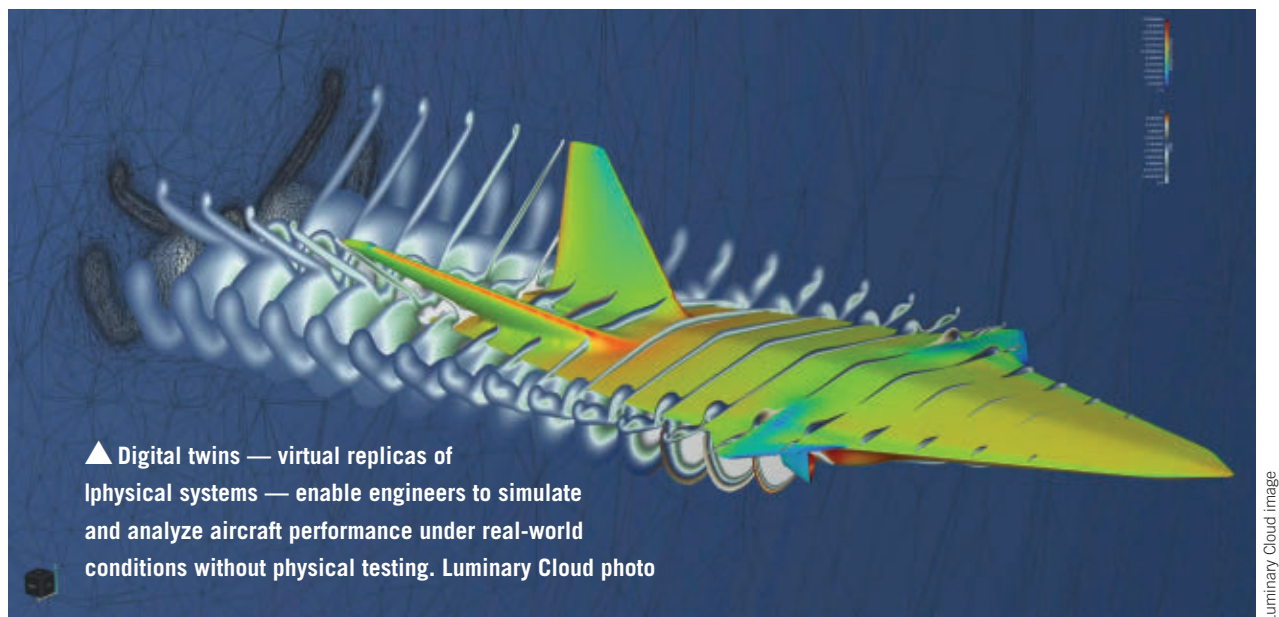
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Rune Aero uses AI-powered virtual wind tunnel to cut aircraft design costs

SAN MATEO, Calif. – Aircraft developer Rune Aero in Atlanta sought to reduce early design costs as it developed its uncrewed aircraft by using an artificial intelligence (AI)-powered virtual wind tunnel and digital twin technology. They found their solution from Luminary Cloud in San Mateo, Calif.

The company, founded in 2023, is developing an autonomous cargo aircraft for the middle-mile air freight market. By leveraging interactive computational fluid dynamics (CFD) simulations from Luminary Cloud and NVIDIA's Omniverse Blueprint digital twin technology, Rune Aero engineers can assess aerodynamic effects in real time, shortening the design process.

Digital twins — virtual replicas of physical systems — enable engineers to simulate and analyze aircraft performance under real-world conditions without physical testing. Rune Aero's system integrates Luminary Cloud's GPU-accelerated CFD solvers, NVIDIA CUDA-X libraries, and AI-driven PhysicsNeMo models to create high-fidelity aerodynamic simulations. These digital environments provide immediate feedback on design

modifications, reducing reliance on costly wind tunnel tests.

"At the early stages of aircraft development, getting fast, accurate, and cost-effective design feedback is essential," said Nadine Auda, Rune Aero co-founder. "Luminary's virtual wind tunnel allows Rune Aero to test configurations earlier in the process, reducing our early development costs by over 80% compared to traditional wind tunnels and enabling faster, smarter design decisions."

"AI physics models are essential for real-time interactive engineering analysis and design but require tremendous amounts of data," said Tim Costa, senior director of CAE EDA and Quantum at NVIDIA. "Luminary Cloud's accelerated CFD solver allows customers to generate the high-fidelity data needed to train the underlying AI physics model in NVIDIA PhysicsNeMo in a matter of hours."

By shifting wind tunnel testing to an early-stage virtual environment, Rune Aero aims to lower technical risks, optimize aerodynamics, and reduce operating costs for cargo operators by 70%. ←

Industry asked for uncrewed systems and data processing for special forces uses

BY John Keller

MacDILL Air Force Base, Fla. – U.S. special operations forces are reaching out to industry for enabling technologies in human-machine teaming for demonstrations next September.

Officials of the U.S. Special Operations Command at MacDill Air Force Base, Fla., issued a request for information (USSOCOM_RFI_TE_25-3_Human_Machine_Teaming) for the Human Machine Teaming project. Areas of interest include uncrewed vehicles, data processing, and networking.

The notice is to solicit emerging technology experimentation candidates



▲ The notice is to solicit emerging technology experimentation candidates for their potential to future special operations capabilities.



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for their potential to future special operations capabilities. Demonstrations will be 8 to 12 Sept. 2025 at the Emerging Technology Institute (ETI) in Red Springs, N.C.

This event gives a chance for technology developers to interact with operational personnel to determine how their technology development may support or enhance special operations capabilities.

Technology areas of interest consist of uncrewed systems; computer data processing at the edge; heterogeneous teaming and uncrewed aircraft swarming; uncrewed systems networking; data transport; voice and data processing; human-machine interfaces; uncrewed ground vehicles; counter-uncrewed technologies; counter-surveillance; blue forces awareness; high-altitude sensor payloads; lightweight air launched glide munitions; and decoy payloads.

Companies interested were asked to submit candidate technologies by May 2025 via the Special Operations Command's Vulcan system online at <https://vulcan-sof.com/login/ng2/auth/login>.

A complete submission involves creating a scout card in the Vulcan system; and filling in the supplemental sheet version may2025 and attaching it to the scout card.

Systems for demonstration should be at technology maturity levels ranging from proofs-of-concepts to advanced prototypes. Experiments for each system may take from half a day to two days.

Experiments that transmit on RF frequencies must have prior approval. Email RF questions and concerns no later than 11 Aug. 2025 at tech_exp@socom.mil. Email questions or concerns to tech_exp@socom.mil. More information is online at <https://sam.gov/opp/6ecbd-f072572404195139a1e67cc0283/view>. ◀



◀ **PROTEAN** project seeks to find ways for defense contractors to bring their EW, electromagnetic warfare, and weapons capabilities for evaluation and integration onto uncrewed vehicles. Epirus Inc. photo

Navy wants new ways to demonstrate electronic warfare (EW) and electromagnetic weapons on uncrewed vehicles

BY John Keller

CRANE, Ind. – U.S. Navy researchers are asking industry for new ways of helping electronic warfare (EW) and electromagnetic weapons designers integrate and test their technologies aboard uncrewed vehicles.

Officials of the Naval Surface Warfare Center in Crane, Ind., issued a request for solutions (N0016425SNB52) on Tuesday for the Prototyping Research and Operations for Tactical Electromagnetic Warfare and Advanced Networking (PROTEAN) project.

The PROTEAN project seeks to find ways for defense contractors to bring their EW, electromagnetic warfare, and weapons capabilities for technical evaluation and integration onto uncrewed vehicles.

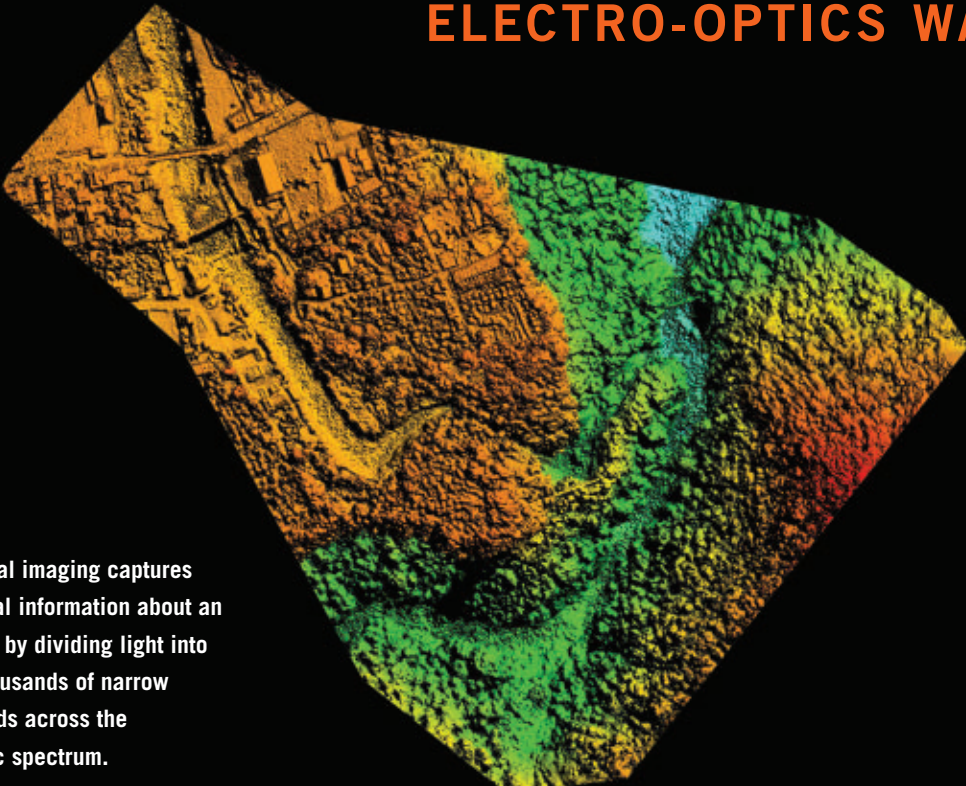
Today there is no way for EW, electromagnetic weapons, seekers, and weapons systems designers to demonstrate their technologies on uncrewed vehicles, Navy researchers explain.

The project also will address technical integration challenges; lack of standardization; insufficient testing and evaluation; inadequate transition paths; operational effectiveness; and limited innovation.

Company officials who would like to respond to this solicitation must be members of the Strategic & Spectrum Missions Advanced Resilient Trusted Systems (S2MARTS) Consortium. Join the S2MARTS Consortium online at <https://s2marts.org/membership/>.

Companies interested were asked to email responses by April 2025 to the Navy's Judy Blanton at judith.a.blanton3.civ@us.navy.mil and Lance Buechler at lance.a.buechler.civ@us.navy.mil.

For questions or concerns contact Judy Blanton by email at judith.a.blanton3.civ@us.navy.mil, or by phone at 812-381-7156 or Lance Buechler by email at lance.a.buechler.civ@us.navy.mil, or by phone at 812-381-2969. More information is online at <https://sam.gov/opp/f48668bd96ec415ba28c2c2d71e45c77/view>. ◀



► Hyperspectral imaging captures detailed spectral information about an object or scene by dividing light into hundreds or thousands of narrow contiguous bands across the electromagnetic spectrum.

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Army surveys industry for expertise in hyperspectral imaging sensors for unmanned aircraft and satellites

BY John Keller

ABERDEEN PROVING GROUND, Md. – U.S. Army electro-optics experts have surveyed industry to find companies able to design and build hyperspectral imaging sensors for common uncrewed aircraft and satellites.

Officials of the Army Contracting Command at Aberdeen Proving Ground, Md., issued a sources-sought notice (W56KGU25R0100) in April

for the Hyperspectral Imaging Capability project.

The Army Contracting Command issued this notice on behalf of the Army Combat Capabilities Development Command (DEVCOM) Command, Control, Computers, Communications, Cyber, Intelligence, Surveillance, and Reconnaissance (C5ISR) Center at Aberdeen Proving Ground.

Hyperspectral imaging captures detailed spectral information about an

object or scene by dividing light into hundreds or thousands of narrow contiguous bands across the electromagnetic spectrum. This helps analyze spectral signatures of different materials and objects, to reveal subtle differences not visible to the naked eye.

Hyperspectral imaging, for example, can detect differences between undisturbed soil, and dirt that has been dug-up recently, which could indicate the presence of hidden explosives.

Hyperspectral imaging wavebands of interest include visible to short-wave infrared, and longwave infrared. Army experts will evaluate responses based on size, weight, and power (SWAP); sensor performance;; quantum efficiency and resolution; and system maturity, stabilization, and integration issues.

Additional details on technical specifications, operational altitudes, and

sensor performance metrics involve controlled unclassified information. Those with proper security clearances may request these details by email to the Army's Hanh Dinh at hanh.t.dinh.civ@army.mil.

This notice to conduct market research to find companies with expertise in hyperspectral imaging for future procurement programs. Companies

interested were asked to email responses by late May to the Army's Hanh Dinh at hanh.t.dinh.civ@army.mil.

Email questions or concerns to Hanh Dinh at hanh.t.dinh.civ@army.mil, or Alex Brown at alexander.e.brown21.civ@army.mil.

More information is online at <https://sam.gov/opp/849ee06a842246558df-64b22a4efcdec/view>. ←

Four companies to develop 3D chip-to-chip and intra-chip photonic interconnects to speed data throughput

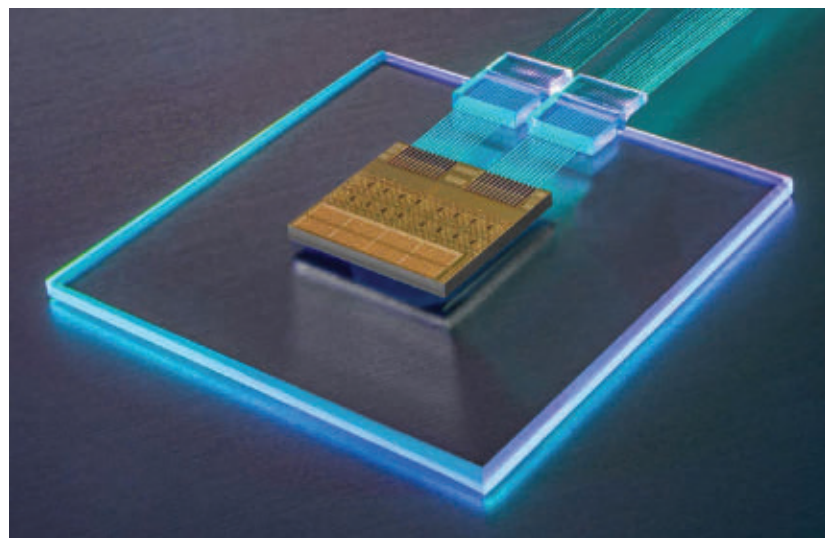
BY John Keller

ARLINGTON, Va. – U.S. military researchers have chosen four technology companies to develop 3D chip-to-chip and intra-chip photonic interconnects to speed military information throughput and reduce vulnerability to electromagnetic interference.

Officials of the U.S. Defense Advanced Research Projects Agency (DARPA) in Arlington, Va., are asking IBM Corp. in Armonk, N.Y.; North Carolina State University in Raleigh, N.C.; the RTX Raytheon segment in Arlington, Va.; and SRI International in Menlo Park, Calif., to pursue the Heterogenous Adaptively Produced Photonic Interfaces (HAPPI) program.

HAPPI focuses on high-density 3D chip optical links and the ability to provide several routing planes within a photonic integrated circuit or photonic interposer to speed information throughput.

The four research organizations will pursue enabling technologies in optical



▲ The four research organizations will pursue enabling technologies in optical computing by performing hardware demonstrations of low-loss, high-density optical interconnects for 3D chips. Ayar Labs photo.

computing by performing hardware demonstrations of low-loss, high-density optical interconnects for 3D chips using a scalable manufacturing process that is compatible with microelectronics.

The project also emphasizes vertical connections between routing layers that

can traverse substrate thickness, and surface methods for coupling light from one photonic chip to another. Chip-to-fiber coupling and chip-to-chip edge coupling are not part of the program.

DARPA researchers are asking IBM, North Carolina State, RTX Raytheon,

and SRI to create optical interfaces that are robust to typical microsystem misalignments due to fabrication and assembly variability, especially for large link arrays that span reticle- or wafer-scale systems.

The four organizations also will pursue robust-by-design or adaptive interfaces capable of environmentally and mechanically stable optical performance, with compatibility with standard microelectronics manufacturing and assembly flows.

IBM, North Carolina State, RTX Raytheon, and SRI will take-on challenges of coupling to a photonic integrated circuit with demonstrated optoelectronic sources, amplifiers, modulators, multiplexers, filters, detectors, and other electro-optical components. The operating wavelengths may be within the visible or near infrared optical bands.

The HAPPI program aims to create a 1000x increase microsystem information transmission density by exploiting photonic signaling. The ability to move and process information efficiently throughout a microsystem requires signal routing technology with high data rates and dense access points.

Photonic links are sparse within the microsystem due to planar optical routing geometries. Increasing the density of photonic links requires moving to 3D optical routing within the chip and between chips, and will enable information delivery when and where it is needed in applications such as signal processing, free-space communications, remote sensing, digital compute, and atomic sensing.

The HAPPI program is a 36-month, two-phase program, with a base and an option period. The 18-month first phase will prove the feasibility of 3D routing in integrated photonics, while the 18-month second phase will scale the

density and prove the manufacturability of the 3D routing platform.

For more information contact IBM online at www.ibm.com; North Carolina State University at www.ncsu.edu/research; RTX Raytheon at www.rtx.com/raytheon, SRI International at www.sri.com, or DARPA at www.darpa.mil/research/programs/happi-heterogeneous. ◀

Envision to provide electro-optical aiming laser and infrared illuminator for infantry weapons

BY John Keller

QUANTICO, Va. – U.S. Marine Corps needed an aiming laser for a variety of infantry rifles and machine guns. They found a solution from Envision Technology LLC in Roanoke, Va.

Officials of the Marine Corps Systems Command at Quantico Marine Base, Va., announced a \$249 million contract for the Squad Aiming Laser system, which consists of a visible alignment laser and infrared aiming laser.

The contract also calls for Envision to

provide spare parts, logistics support, and test article refurbishment. The Squad Aiming Laser system also consists of a visible laser pointer, near-infrared laser pointer, near-infrared laser illuminator, rail weapon mount, batteries, and remote-control unit.

The Squad Aiming Laser is for infantry weapons such as the Marine Corps M27 infantry automatic rifle; M4A1 infantry assault rifle; M240B medium machine gun; M110 sniper rifle; and XM7 Next Generation Squad Weapon (NGSW).



▲ The Squad Aiming Laser is for the M27 infantry automatic rifle; M4A1 infantry assault rifle; M240B medium machine gun; M110 sniper rifle; and XM7 Next Generation Squad Weapon (NGSW).

The Squad Aiming Laser's visible alignment laser is a narrow beam laser primarily used to align the system to the host weapon. The visible alignment laser can be viewed with the naked eye. The visible alignment laser is visible to the operator when projected on targets at a range of 82 feet.

The visible alignment laser is visible to the operator when projected on targets as far away as 328 feet. It has switch-selectable output power for different levels of operation.

The infrared aiming laser is a narrow-beam laser for aiming and pointing in weapon-mounted and hand-held applications. The infrared aiming laser can be viewed with night-vision devices on targets from as far away as 1,968 feet.

The output power of the Squad Aiming Laser infrared aiming laser also is switch selectable for several levels of

operation. Its low-power and setting has half a milliwatt of output power; its tactical setting has seven milliwatts of output power; and its high-power setting has from 25 to 100 milliwatts of output power. Its peak wavelength is 850 nanometers.

The infrared illuminator laser of the Squad Aiming Laser is for infrared illumination of targets, and can be viewed on targets with night-vision devices from as far away as 1,968 feet. The system also can provide close-quarters infrared illumination.

The Squad Aiming Laser has controls for momentary and continuous activation, so as not to disturb the shooter's natural firing position. The system weighs less than 10.5 ounces, is located 1.37 inches above is mounting rail, and is smaller than 28 cubic inches.

Powering the Squad Aiming Laser are CR-123A or L-91 batteries, which

last for at least four to eight hours, with battery changes without removal from the weapon and without tools. The aiming laser can be used with combat gloves.

The Squad Aiming Laser can function at altitudes of 30,000 feet above sea level, survive helicopter vibration, and operate in temperatures from -20 to 50 degrees Celsius. It can survive contact with common chemicals, sea water, dust, and salt water immersion.

Envision prevailed in this competition over two other bidders. The company will do the work on this contract in Manchester, N.H., and should be finished by February 2030. For more information contact Envision Technology online at <https://envision-tek.com>, or Marine Corps Systems Command at <https://www.marcomsys.com.marines.mil>. ←

Fiber-optic cable assemblies for long- and short-range networking, data storage, and coms offered by L-com

L-com, an Infinite Electronics brand in North Andover, Mass. is introducing a line of four- and six-strand multi-fiber distribution cable assemblies for enterprise networking, data centers, cloud-based services, data storage, and communications. The four-strand fiber-optic assemblies are for small low-demand setups, while six strands can accommodate medium- to large-scale installations that anticipate future growth and increased bandwidth needs. Other applications include local-area networking, passive optical networks, intra-building backbones, and head-end termination to fiber backbones and multi-floor deployments. L-com's multi-fiber distribution assemblies

offer a wide range of connectors, fiber modes, jackets and lengths. Connector combinations are standard SC-SC or, for higher-density installations, the more compact LC-LC. Fiber modes include short-range multimode OM5, OM3, OM1 fiber, or long-range single-mode OS2. Cable jacket options are general-purpose PVC, flame-retardant OFNR-rated riser, or the even more flame-retardant OFNP-rated plenum. Standard cable assembly lengths of 5, 10 or 15 meters are available. For more information contact L-com online at www.l-com.com.

Broadband high-power light-emitting diode (LED) emitter introduced by EPIGAP OSA

EPIGAP OSA Photonics GmbH in Berlin is introducing the OCL-480 GIR broadband high-power electro-optical

light-emitting diode (LED) emitter for hyperspectral imaging and biomedical analysis applications. The broadband conversion surface-mounted devices (SMD) emit a spectrum from 420 to 1050 nanometers with radiant intensity of 95 milliwatts per steradian (typical), and a viewing angle of 120 degrees. The high-power broadband SMD LED can replace specialty lamps that produce too much heat, are obsolete, or nearing end-of-life. The OCL-480 XE428 model is a replacement for mercury lamps, and xenon and tungsten-halogen. Other applications for this LED emitter include security, spectroscopy, agricultural analysis, food illumination, medical research, tissue analysis, and environmental monitoring. For more information contact EPIGAP OSA Photonics online at www.epigap-osa.com. ←



SONAR SIGNAL PROCESSING

► Navy asks Northrop Grumman for advanced sonar signal processing for anti-submarine warfare

U.S. Navy researchers needed new approaches to sonar signal processing for situational awareness and potential enemy attack. They found a solution from the Northrop Grumman Corp. in Annapolis, Md.

Officials of the Office of Naval Research in Arlington, Va., announced a potential \$24.9 million contract to the Northrop Grumman Mission Systems undersea systems segment in Annapolis, Md., for the Full Spectrum Undersea Warfare Innovative Naval Prototype Autonomous Undersea Exploitation project.

This contract calls for Northrop Grumman engineers to push the state of the art in sonar-based perception and exploitation by developing specialized algorithms and sensor for autonomous sensing, and to verify that sensors are producing the correct information.

This contract involves sonar design, real time processing, perception, and autonomy for submarine, shipboard, and land-based sonar systems for maritime situational awareness, surface ship tracking, and anti-submarine warfare (ASW).

Earlier this year Northrop Grumman won a \$15.2 million order to upgrade and repair the U.S. Navy AN/AQS-24 airborne and surface mine hunting and detection sonar system.

The AN/AQS-24 can be towed through the water by surface vessels and helicopters in areas where naval commanders believe enemy anti-ship mines may be present. The system can work at speeds as fast as 18 knots.

It uses high-resolution side-scan sonar for real-time detection, localization, and classification of bottom and moored mines at high area coverage rates. Its laser line scanner provides precision optical identification of underwater mines and other objects of interest.

Its sonar and laser line scanner can work at the same time to detect and identify sea mines and other underwater objects. The system offers target box cuing and high-speed operation to provide high-resolution optical imagery for target identification.

The AN/AQS-24 offers synthetic aperture sonar and advanced navigation controls and digital signal processing for target positioning. The system is rapidly deployable, and has been towed from aircraft, surface ships, and remotely operated vehicles.

The synthetic aperture sonar enables the device to scan the ocean floor at three times the resolution of the earlier system. The Navy operates the AQS-24B from MH-53E helicopters and Mine Hunting Unmanned Surface Vessels (MHU).

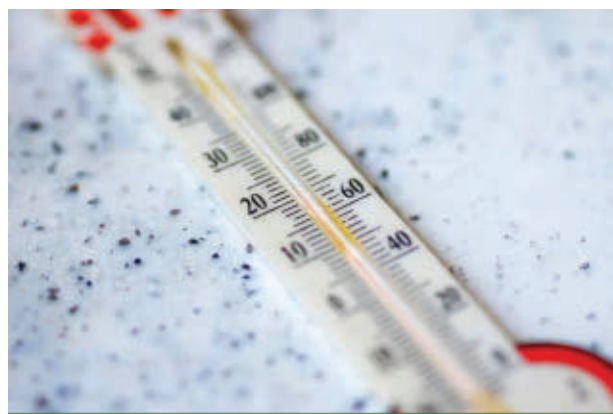
Northrop Grumman also produces the MicroSAS small-size interferometric synthetic aperture sonar that enables long sorties and high area coverage rates for unmanned undersea vehicles (UUV).

On the Full Spectrum Undersea Warfare Innovative Naval Prototype Autonomous Undersea Exploitation project, Northrop Grumman will do the work in Annapolis, Md., and should be finished in March 2030. For more information contact Northrop Grumman online at www.northropgrumman.com/what-we-do/sea.

SENSORS

► Honeywell to develop atomic vapor sensors for millimeter-wave communications

U.S. military researchers are asking Honeywell International Inc. to enhance atomic vapor sensors for electric field sensing, imaging, communications, and quantum information science (QIS).



Officials of the U.S. Defense Advanced research Projects Agency (DARPA) in Arlington, Va., announced a \$1.5 million contract to Honeywell International for the Enhancing Quantum Sensor Technologies with Rydberg Atoms (EQSTRA) program.

EQSTRA seeks to enhance the performance, capabilities, and maturity of atomic vapor sensors for future compact, calibration-free, small, and lightweight devices with low drift, and quantum-limited accuracy and sensitivity.

Previous research in atomic vapors applications has helped improve vapor-based technologies such as compact atomic clocks and nuclear magnetic gyroscopes. Technologies based on Rydberg atomic vapors hold the potential to enable new capabilities in RF electrometry, imaging, and communications.

Still, Rydberg-based technologies have high sensitivity, fragility, and technical complexities, and have problems that have impeded rapid maturation.

Instead, the EQSTRA program seeks to enhance the capabilities of Rydberg-based technologies extending into the millimeter-wave domain; accelerate Rydberg-based technology development to high TRL and quantum-limited performance; and study Rydberg-based vapor technologies for U.S. military such as quantum-enhanced sensing, imaging, and communications.

EQSTRA seeks to build on the DARPA Science of Atomic Vapors for New Technologies (SAVaNT) program to advance the performance, capabilities, and application landscape of Rydberg-vapor technologies for QIS, quantum-enhanced electrometry, imaging, and communications.

The SAVaNT program, launched in August 2020, sought to develop techniques to mitigate the effects of thermal motion and decoherence within broad categories of vapor-based sensing technologies, and demonstrate new levels of sensitivity, accuracy, and detection bandwidth in vapor-based magnetometers and electrometers.

DARPA awarded a \$3.6 million SAVaNT contract in April 2021 to ColdQuanta Inc. in Boulder, Colo., to advance the performance of atomic vapors for electric field sensing in applications ranging from airborne electronic warfare (EW) to naval anti-submarine warfare (ASW). The program aimed to advance the integration of Rydberg-based electrometers to demonstrate a tabletop physics package.

Now researchers want to learn more, through four EQSTRA focus areas: developing atomically referenced tunable, narrow line-width sources of terahertz radiation; developing small and lightweight integrated Rydberg electrometers; developing wafer-scale vapor cells for wideband Rydberg electrometry; and studying Rydberg-based quantum technologies.

For more information contact Honeywell International online at <https://automation.honeywell.com/us/en/products/sensing-solutions/sensors/gas-sensors>, or DARPA at www.darpa.mil. Email questions or concerns to DARPA's

Mukund Vengalattore, the EQSTRA program manager, at EQSTRA@darpa.mil.

ELECTRONIC WARFARE (EW)

► Lockheed Martin to develop airborne electronic warfare (EW) software that runs on SOSA-aligned computers

U.S. Air Force electronic warfare (EW) experts are asking Lockheed Martin Corp. to develop software that helps aircraft pilots understand and manage electromagnetic situational awareness for airborne EW.

Officials of the Air Force Research Laboratory at Wright-Patterson Air Force Base, Ohio, announced a \$15.9 million contract to the Lockheed Martin Advanced Technology Laboratories segment in Cherry Hill, N.J. for the Ephemeral Paragon (E-Gon) program.

E-Gon seeks an advanced software suite of tactical single-ship EW capabilities to provide an enhanced understanding of the electromagnetic operating environment with a focus on algorithm adaptation, EW system management, and data management of the electromagnetic operating environment.



Researchers are asking Lockheed Martin to develop E-Gon computer hardware that complies with the Sensor Open Systems Architecture (SOSA), Open Mission systems (OMS), and Big Iron open-systems standards.

The E-Gon's five technical areas and details considered controlled information and are not openly available. The Air Force will award one contract for each of the five technical areas. Each technical area will mature existing government-owned algorithms until technologies are mature enough for prototype demonstration in a real-world environment.

Ultimately, the project seeks to mature E-Gon software sufficiently to enable one systems integrator to build the software into a tactical platform.

More information

For more information contact Lockheed Martin Advanced Technology Laboratories online at www.lockheedmartin.com/en-us/capabilities/research-labs/advanced-technology-labs.html, or the Air Force Research Laboratory at www.afrl.af.mil.

Email technical questions or concerns to Paul Repasky at paul.repasky@us.af.mil, and contracting questions to the Air Force's Colleen McDonald at colleen.mcdonald@us.af.mil.

DATA ACQUISITION

► Curtiss-Wright to provide high-speed data acquisition equipment for military aircraft

U.S. Air Force airborne test and measurement experts needed high-speed data acquisition systems hardware and repair services. They found their solution from the Curtiss-Wright Corp. Defense Solutions segment in Ashburn, Va.

Officials of 99th Contracting Squadron at Nellis Air Force Base, Nev., announced a \$79.9 million contract to Curtiss-Wright to provide high-speed data acquisition systems that will provide ancillary support services to the 99th Test and Evaluation Squadron.

This test and measurement equipment is to help evaluate military aircraft during flight trials.

This pool essentially is a dedicated inventory of advanced instrumentation that Air Force experts can deploy on various aircraft types to gather detailed data during rigorous flight test maneuvers, and allows for



efficient and flexible instrumentation setup for different flight test scenarios.

Last January Curtiss-Wright won a \$49.9 million sole-source contract from U.S. Naval Air Systems Command at Patuxent River Naval Air Station, Md., to provide high-speed data acquisition systems for the Naval Air Systems Command Special Flight Test Instrumentation Pool.

Curtiss-Wright offers several products for military aircraft data acquisition and test instrumentation. Central to these products is the Curtiss-Wright ADSR data recording system family that helps users capture, record, and output data based on their unique requirements.

The ADSR product family consists of advanced data server and recorder (ADSR) products for uses such as mission data recording, mission file servers, digital video recorders, or instrumentation network recorders.

Curtiss-Wright also provides the nREC-7000-1 data recorder, which can store data at fast sustained speeds, with support for 1,000 Megabytes per second data rates over each of its four 10-Gigabit Ethernet ports. It supports simultaneous data recording of several data formats such as DARv3, PCAP, IRIG-106 Chapter 10/11, and NFS.

On this contract Curtiss-Wright will do the work at Nellis Air Force Base, Nev., and should be finished by March 2030. For more information contact Curtiss-Wright Defense Solutions online at www.curtisswrightds.com/products/storage-recorders/test-recorders, or the 99th Air Base Wing at Nellis Air Force Base at <https://www.nellis.af.mil/About/Fact-Sheets/Display/Article/284154/99th-air-base-wing/>.

SOFTWARE

► **Booz Allen, Peraton to build SOSA-based advanced software for electronic warfare (EW) situational awareness**

U.S. Air Force electronic warfare (EW) experts are asking two more defense companies to develop software that helps aircraft pilots understand and manage electromagnetic situational awareness for airborne EW.

Officials of the Air Force Research Laboratory at Wright-Patterson Air Force Base, Ohio, announced contracts Thursday to Booz Allen Hamilton Inc. in McLean Va., and to Peraton Labs Inc. in Basking Ridge, N.J., for the Ephemeral Paragon (E-Gon) program.

E-Gon seeks an advanced software suite of tactical single-ship EW capabilities to provide an enhanced



understanding of the electromagnetic operating environment with a focus on algorithm adaptation, EW system management, and data management of the electromagnetic operating environment.

Booz Allen won a \$7.7 million E-Gon contract and Peraton Labs won a \$6.8 million E-Gon contract. These companies join the Lockheed Martin Advanced Technology Laboratories segment in Cherry Hill, N.J., which won a \$15.9 million E-Gon contract in late March.

Researchers are asking the three companies to develop E-Gon computer hardware that complies with the Sensor Open Systems Architecture (SOSA), Open Mission systems (OMS), and Big Iron open-systems standards.

E-Gon's five technical areas and details considered controlled information and are not openly available. The Air Force will award one contract for each of the five technical areas. Each technical area will mature existing government-owned algorithms until technologies are mature enough for prototype demonstration in a real-world environment.

Ultimately, the project seeks to mature E-Gon software sufficiently to enable one systems integrator to build the software into a tactical platform.

For more information contact Booz Allen Hamilton online at www.boozallen.com; Peraton Labs at www.peratonlabs.com; the Lockheed Martin Advanced Technology Laboratories at www.lockheedmartin.com/en-us/capabilities/research-labs/advanced-technology-labs.html; or the Air Force Research Laboratory at www.afrl.af.mil.

Email technical questions or concerns to the Air Force's Paul Repasky at paul.repasky@us.af.mil, and contracting questions to the Air Force's Colleen McDonald at colleen.mcdonald@us.af.mil.

RADAR

► Leidos Dynetics to build medium-range radar for Marines expeditionary air defense



U.S. Marine Corps surveillance experts needed a new radar system to enhance medium-range air-defense capabilities. They found a solution from Dynetics, a Leidos company in Huntsville, Ala.

Officials of the Marine Corps Systems Command at Quantico Marine Base, Va., announced a \$24.9 million contract to Dynetics for six Medium Range Air Defense Radar (MRADR) production-representative model systems.

MRADR aims to provide target detection with a 360-degree field of view, drawing on lessons learned from other programs like the Marine Expeditionary Long Range Persistent Sensor (MELPS), which combines digitized antennas, receivers, and digital signal processing for a high-quality air picture without a detectable electromagnetic footprint.

Marine Corps leaders say they plan to integrate MRADR with Marine Corps. existing air defense systems, such as pairing it with the AN/TPS-80 Ground/Air Task-Oriented Radar (G/ATOR), a multi-purpose active electronically scanned array (AESA) radar that offers 360-degree coverage.

The MRADR is part of broader Marine Corps modernization in ground-based air defense to defend against aerial threats like helicopters, fixed-wing crewed aircraft, cruise missiles, and uncrewed aircraft.

The Marine Corps awarded a \$32.1 million contract in September 2023 to Dynetics, together with the Consortium Management Group Inc. in Washington for four MRADR prototype systems. The Consortium Management Group is a nonprofit organization that manages other transaction agreement (OTA) consortia.

The Marines will use MRADR to detect, track, identify, and defeat enemy cruise missiles and other crewed and uncrewed aerial threats. MRADR system is designed to be mobile and expeditionary by integrating with missile

systems like the Medium Range Intercept Capability (MRIC), which comes from Israel's Iron Dome technology.

The radar works with missile launchers and command units in a secure wireless network. MRADR is being developed to work with transporter erector launchers on amphibious combat vehicle chassis (ACV-MRAD). The Corps retired its last medium-range system in the late 1990s.

On this contract, Dynetics will do the work in Huntsville, Ala., and in Woodlake, Calif., and should be finished by 2027. For more information contact Dynetics, a Leidos company, online at www.leidos.com/insights/dynetics, or Marine Corps Systems Command at www.marcorsyscom.marines.mil.

EMP PROTECTION

► Converge Strategies to protect military electric grid from EMP and cyber-attacks

The U.S. Army Corps of Engineers needed ways to strengthen the electric grid against physical threats such as electromagnetic pulse (EMP) attacks, as well as against cyber threats. They found a solution from Converge Strategies LLC in Boston.

Officials of the Army Corps of Engineers Humphreys Engineer Center Support Activity (HECSA) in Alexandria, Va., announced a \$2.3 million contract to Converge Strategies for the Defense Innovations to Mitigate Electricity Grid Risk program.

Defense Innovations to Mitigate Electricity Grid Risk involves strengthening grid resilience, developing



microgrid systems for defense, hardening infrastructure against physical and cyber threats, and adopting advanced technologies for reliability and security.

Electric grid resilience and transmission expansion involves enhancing power transmission to ensure reliable energy supply for the military. This can include strengthening power infrastructure, expanding transmission lines, and enhancing redundancy to reduce vulnerabilities to regional outages.

Microgrids for defense energy architecture involves developing microgrids based on small modular reactors, renewable energy, and advanced energy storage like hydrogen batteries to create self-sufficient regional power sources that can operate independently from the national grid. This approach can protect military installations from widespread grid failures from cyber-attacks, EMP attacks, or similar threats.

Hardening against EMP and cyber-attacks can involve technologies like Faraday cages, undergrounding power lines, reactors, and improving physical security to protect the grid from electromagnetic and cyber-attack.

Grid-enhancing technologies can involve advanced conductors and real-time grid management to enhance the capacity and efficiency of existing transmission lines; optimizing grid performance; and reducing failure points.

For more information contact Converge Strategies online at <https://convergestrategies.com>, or the Army Corps of Engineers at www.usace.army.mil.

DISPLAYS

► Kopin to provide microdisplay for version of future anti-air missile guidance

Lockheed Martin Corp. engineers developing a next-generation short-range anti-air missile needed a visual display subsystem to help keep the missile on target. They found a solution from Kopin Corp. in Westborough, Mass.

Officials of the Lockheed Martin Missiles and Fire Control segment in Orlando, Fla., have selected Kopin for the Visual Display Subsystem (VDS) on Lockheed Martin's version of the future Next-Generation Short-Range Interceptor (NGSRI).

Kopin will build and test the high-resolution VDS assembly for the Lockheed Martin NGSRI. Kopin's visual display includes the company's organic light emitting



diode (OLED) microdisplay, drive electronics, and optical designs for the Command Launch Assembly (CLA) component in the Lockheed Martin NGSRI version. Kopin will deliver VDS assemblies for simulated and operational missile launch tests.

The NGSRI is being developed for the U.S. Army to replace the legacy FIM-92 Stinger shoulder-fired anti-aircraft missile, which is unable to handle modern aerial threats like advanced drones, cruise missiles, and hypersonic missiles.

The U.S. Army Combat Capabilities Development Command Aviation & Missile Center (DEVCOM AvMC) at Redstone Arsenal, Ala., chose the RTX Raytheon Land & Air Defense Systems division in Tucson, Ariz., and Lockheed Martin Missiles and Fire Control in 2023 to develop competing NGSRI prototypes. An NGSRI downselect and initial production is set for 2028.

The NGSRI is expected to counter a wide range of aerial threats like enemy helicopters, fixed-wing aircraft, cruise missiles, and hypersonic weapons. It is to have greater speed, maneuverability, and targeting precision than the Stinger.

The NGSRI's seeker reportedly can identify and track small uncrewed aerial vehicles (UAVs) from as far away as three miles in harsh conditions like sandstorms. Its solid-propellant rocket motor should offer longer burn time, increased energy output, and extended intercept range than the Stinger.

The NGSRI guidance and control system will use multi-mode sensor technology that combines radar, infrared sensors, and visible-light cameras, and will in low-visibility conditions like sandstorms and complex electromagnetic conditions.

For more information contact Kopin Corp. online at www.kopin.com, Lockheed Martin Missiles and Fire

Control at www.lockheedmartin.com/en-us/who-we-are/business-areas/missiles-and-fire-control.html, or the Army Combat Capabilities Development Command Aviation & Missile Center (DEVCOM AvMC) at www.avmc.army.mil.

POWER ELECTRONICS

► **NASA taps Yank Technologies for power systems on Moon, Mars**

Yank Technologies in Brooklyn, N.Y., has been awarded two additional National Aeronautics and Space Administration (NASA) Small Business Innovation Research (SBIR) contracts to develop wireless charging solutions for lunar applications. NASA SBIR contracts allow small business innovators to be a part of the growing aerospace ecosystem.



Yank Technologies specializes in eliminating cables to enhance durability, operational efficiency, and product innovation. Their industrial applications improve factory robotics by charging autonomous mobile robots (AMRs) on the move and wirelessly powering quality control tests. In the automotive sector, Yank Technologies creates wireless power systems that reduce assembly and warranty costs and enable new vehicle interior features such as seamless door removal and cockpit reconfiguration. For consumers, they offer solutions to charge multiple electronics wirelessly on table-tops, in cupholders, and over the air.

In 2025, the U.S. House of Representatives allocated \$7.8 billion to NASA's Artemis I Program, aimed at returning humans to the Moon. This funding provides Yank Technologies an opportunity to extend their wireless power solutions to space applications.

Yank Technologies plans to develop two systems for the lunar surface: Wireless Power Receiver Converters

for lunar rovers and Resonant Inductive Connectors for high voltage power transmission on the Moon and Mars.

The Wireless Power Receiver Converters are designed to improve rover efficiency and reduce mass by integrating multiple converters into a single-stage converter that supports various voltages. These converters also enhance charging reliability by accommodating misalignment and varying distances.

Resonant Inductive Connectors are designed to maintain reliable connections with high-voltage lines despite the presence of lunar regolith or Martian dust. Unlike traditional connectors, which are prone to wear and unreliable connections, these connectors are built to withstand harsh environments. For more information contact Yank Technologies online at www.yanktechnologies.com.

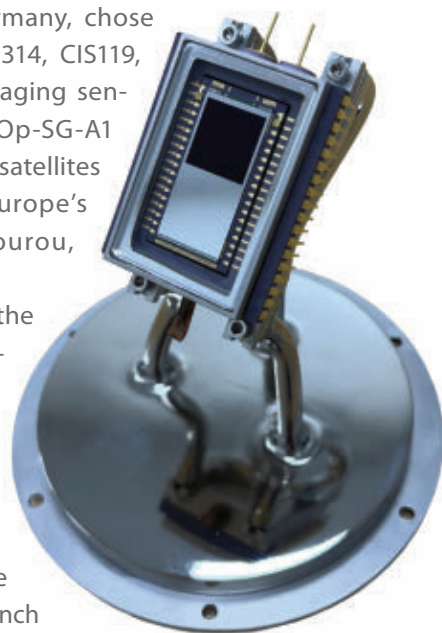
IMAGING SENSORS

► **Teledyne Space to provide imaging sensors on European MetOp-SG-A1 Earth-observation satellites**

Satellite designers at Airbus Defence and Space GmbH in Ottobrunn, Germany, needed detectors for three imaging sensors aboard the European MetOp-SG-A1 Earth-observation satellites. They found a solution from Teledyne Space Imaging in Chelmsford, England.

Airbus Defence and Space GmbH in Ottobrunn, Germany, chose the Teledyne CCD314, CIS119, and CCD327-20 imaging sensors for the MetOp-SG-A1 Earth-observation satellites launched from Europe's Spaceport in Kourou, French Guiana.

MetOp-SG-A1 is the first pair of next-generation satellites that will orbit the Earth together 14 times a day to observe any location on Earth. Three satellite pairs will launch over the next two decades.



The Teledyne Space Imaging CCD314 sensor is a large-format frame transfer charge-coupled device imaging sensor designed for Earth observation and science missions.

The Teledyne Space Imaging CIS119 is a custom complementary metal oxide semiconductor (CMOS) imaging sensor developed for meteorological and climate observation from space. The Teledyne Space Imaging CCD327-20 is a sensor housed in the 3MI instrument on EUMETSAT's MetOp-SG-A1 satellite. The CCD327-20 is based on the Teledyne CCD47-20 sensor, and covers the visible-to-near-infrared wavelength bands from 400 to 920 nanometers. Teledyne Space Imaging also supplied detectors for three instruments on the MetOp-SG-A1 satellite.

The MetOp-SG satellites are developed under a European Space Agency (ESA) contract by a European industrial consortium led by Airbus Defence and Space.

The Sentinel-5 satellite, which is part of the MetOp-SG-A1 Earth-observation satellite system, is a high-resolution imaging spectrometer that will monitor Earth's atmosphere globally. The spacecraft analyzes light reflected by the atmosphere across ultraviolet, visible, near-infrared, and shortwave infrared wavelengths to provide detailed measurements of atmospheric gases and aerosols.

For more information contact Teledyne Space Imaging online at www.teledyne-e2v.com/en-us, or Airbus Defence and Space at www.airbus.com/en/products-services/space.

RF AND MICROWAVE

► Three companies pursue RF technologies for persistent surveillance radar and electronic warfare (EW)

U.S. Air Force researchers are looking to three defense technology companies to advance radio frequency (RF) technologies to support military spectrum operations; electronic warfare (EW); communications; sensing and surveillance; and multifunction systems.

Officials of the Air Force Research Laboratory at Wright-Patterson Air Force Base, Ohio, announced contracts in August collectively worth \$95 million for the Science and Technology Applied Radio Frequency (RF) Systems (STARS) program.

STARS will prototype RF systems for realistic environments to help the U.S. military keep pace with rapidly changing enemy electronic jamming, spoofing, and spectrum denial, while maintaining the U.S. military's secure access to the electromagnetic spectrum.



The companies that will share \$95 million in the STARS program are Defense Engineering Corp. in Beavercreek, Ohio; Radial Research and Development in Fairborn Ohio; and Matrix Research Inc. in Dayton, Ohio.

STARS is intended to support warfighter training, testing, and operational exercises, and help bridge the gap between basic research and fielded systems.

The program seeks to enhance situational awareness, management, and RF spectrum use; develop advanced RF countermeasures, jamming, and deception technologies; improve resilience, security, and efficiency of tactical RF communications in congested and contested environments; capitalize on RF technologies for radar, passive detection, and long-range sensing; and pursue converged RF architectures that can perform communications, radar, and EW functions on the same hardware.

STARS involves algorithm and software design for RF and digital signal processing; and creating simulation for technology testing and refinement.

It's been speculated that enabling technologies developed under the STARS program will help the Air Force replace aging systems such as the Joint Surveillance Target Attack Radar System (Joint STARS) and the Airborne Early Warning And Control (AWACS) surveillance aircraft.

On these contracts, the companies will do the work at their own facilities, and should be finished by August 2031. For more information contact the U.S. Air Force Research Laboratory online at www.afrl.af.mil. ◀

BOARD PRODUCTS

► **Multicore embedded computing board with Ethernet introduced by X-ES**

Extreme Engineering Solutions (X-ES) in Verona, Wis., is introducing the XPedite2770 heterogeneous embedded computing board for aerospace and defense, cloud



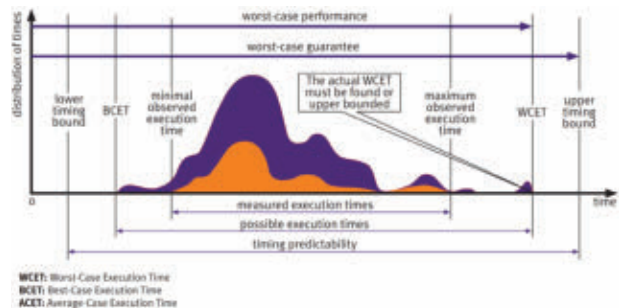
computing, and 5G wireless infrastructure applications. The XPedite2770 uses two ARM Cortex-A72 processor cores, two ARM Cortex-R5F real-time processor cores, a Network-on-Chip (NoC) interconnect, and a large field-programmable gate array (FPGA) fabric. The XPedite2770 is for high-bandwidth applications such as packet processing, signal processing, DSP-intensive applications, sensor I/O, and next-generation wired and 5G wireless infrastructure. The computer board provides speed with two x4 PCI Express interfaces and two 10/100/1000BASE-T Ethernet ports, accommodates as much as 256 gigabytes of onboard NAND flash, and several I/O ports — including LVDS, single-ended GPIO, and RS-232/422/485 serial through the backplane connectors. Additional expansion capabilities are available from an integrated switched mezzanine card (XMC) site, which includes a x8 PCI Express connection to the Versal Prime ACAP and X12d I/O mapped to the VPX backplane connectors. For more information contact X-ES online at www.xes-inc.com/?s=XPedite2770.

SOFTWARE DEVELOPMENT

► **Software design and development tools for worst-case execution time analysis introduced by LDRA**

LDRA in Wirral, England, is introducing an upgraded LDRA software-development tools that supports the

hardware-based multicore mitigation capabilities of RISC-V processors such as Microchip, Synopsys, and ANDES Technology. Developers can access and optimize RISC-V-based multicore systems, including analyzing shared resources and data coherency on worst-case execution time. These design and development tools enable developers to automate worst-case execution time analysis as part of continuous development. This worst-case execution time inclusion streamlines design, increases reliability, accelerates time-to-market, and guarantees deterministic execution in software-intensive aerospace, defense, avionics, automotive, industrial, energy, and



medical applications. The LDRA tool suite supports multicore RISC-V architectures that address multicore contention in hardware. This support gives developers access to the full suite of LDRA tools, including static and structural coverage analysis, MISRA compliance and extensive reporting capabilities, all while taking full advantage of RISC-V-based multicore mitigation capabilities. For more information contact LDRA online at <https://ldra.com>.

THERMAL MANAGEMENT

► **Liquid cooling design and development tools for high-performance computing introduced by Vertiv**

Vertiv in Westerville, Ohio, is introducing the Vertiv Liquid Cooling Services design and development tools to help in the design of advanced liquid cooling systems. Vertiv Liquid Cooling Services focuses on integration of liquid cooling systems with IT equipment and adjacent infrastructure. These services include installation and commissioning, maintenance, fluid management, cleanliness, and preventing air from entering the system. It provides preventive and condition-based maintenance, and can support AI-driven and high-performance computing. Services include startup and commissioning; spare parts



availability; life cycle support; fluid management; and emergency and preventive support. For more information contact Vertiv online at www.vertiv.com/en-us.

EMBEDDED COMPUTING

► **SOSA development backplane and chassis manager for embedded computing introduced by Pixus**

Pixus Technologies in Waterloo, Ontario, is introducing a C5ISR Modular Suite of Standards (CMOSS) and SOSA development backplane that supports various I/O intensive, compute intensive, switches, PNT, and VITA 62 power supply slots. The 8-slot embedded computing development backplane has the utility plane routed, including power, ground, SMBus, clock, and utility signals. This facilitates different plug-in card configurations. Three of the slots have a cutouts for VITA 67.3c interfaces and one slot has a VITA 67.3d cutout. The unit can be purchased in an open-frame, rackmount, desktop, or other chassis format. It includes a Pixus SOSA aligned Tier 3 chassis manager development kit, which cables to the backplane. Pixus offers various OpenVPX backplane and chassis systems in commercial, development, and MIL rugged formats.



The company also provides IEEE and Eurocard components for the embedded computer market. For more information contact Pixus Technologies online at www.pixustechnologies.com.

POWER ELECTRONICS

► **AC-DC power front-end modules for avionics and ruggedized systems introduced by Gaia**

Gaia Converter in Le Haillan, France, is introducing the power factor-corrected HGMM series AC-DC front-end modules for centralized avionics power architectures with PoL or isolated DC modules. These power electronics devices are compatible with common airborne AC input bus voltages and variable frequencies, meet the stringent requirements of DO-160, ABD-100, and



Mil-Std-704 specifications. Gaia's AC-DC aviation and avionics front-end modules provide soft-start, active current limitation, short circuit protection, and inhibit functions. The soft-start/active current limitation prevents inrush current during start-up. Short-circuit protection safeguards the module by shutting down and restoring to normal when the overload is removed. Front-end series under 50 Watts offer two isolated low voltage outputs. Models above 150 Watts provide non-isolated high voltage output. For more information contact Gaia Converter online at www.gaia-converter.com/power-architectures/avionics-defense-power-architectures.

DESIGN AND DEVELOPMENT TOOLS

► **Design and development system 6U OpenVPX cards offered by Elma**

Elma Electronic Inc. in Fremont, Calif., is introducing the Liquid Flow Through (LFT) VITA 48.4 modular test and development chassis for rapid prototyping and testing

of as many as six 6U OpenVPX embedded computing plug-in cards with power densities of 200 Watts or more. The self-contained test and measurement system is for proof-of-concept testing of mission-critical aerospace and defense applications like sensor payloads, electronic



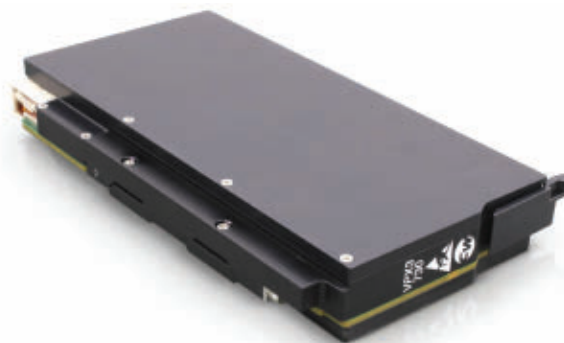
warfare (EW), command and control, navigation systems, and target tracking. The system's power and ground backplane ensures dependable power and signal routing across all six plug-in card slots via the utility plane.

Its 10-gigabit-per-second data rate helps the system keep pace with high-throughput applications. The design and development system facilitates access to the plug-in cards via the open side frame design. Support for rear transition I/O across all slots ensures rapid system configuration for benchtop test and debugging. Designed for high-performance thermal management through integrated liquid cooling channels, the system works in liquid-cooled test environments and with liquid-flow-through plug-in cards from major manufacturers. An external coolant distribution unit is necessary to operate the liquid-flow-through cooling. For more information, contact Elma Electronic online at <https://products.elma.com/products/39e6avxc8ycnnb>.

EMBEDDED COMPUTING

► **SOSA-aligned rugged embedded computing module introduced by Curtiss-Wright**

The Curtiss-Wright Corp. Defense Solutions Division in Ashburn, Va., is introducing the VPX3-730 high-performance SOSA-aligned 3U VPX graphics processing unit (GPU) module for radar, display, and sensor-fusion applications that need deep-learning inference and powerful math engines for artificial intelligence (AI) workloads. The rugged VPX3-730 features the NVIDIA RTX PRO 5000 Blackwell GPU for inferencing, AI, machine learning, and vector processing, and delivers as much as 15 times higher performance compared to other accelerated computers. The embedded computing module also enables system integrators to use NVIDIA's software



that includes NVIDIA AI Enterprise, deep learning frameworks, and neural network libraries. The SOSA-aligned VPX3-730 provides designers of Modular Open Systems Approach (MOSA) systems with large amounts of NVIDIA CUDA cores, NVIDIA Tensor Cores, and local memory, with support for NVIDIA ConnectX-7 100-gigabit-per-second Ethernet network interface cards with PCI Express Gen5 connectivity and as much as 50 trillion floating point operations per second of peak compute performance. For more information contact Curtiss-Wright Defense Solutions online at www.curtisswrightds.com.

TEST AND MEASUREMENT

► **Test systems for SerDes standards compliance introduced by Teledyne LeCroy**

Teledyne LeCroy in Chestnut Ridge, N.Y., is introducing the automated compliance test and measurement option for the Automotive Serdes Alliance (ASA) Motion Link (ML) v1.1 specification for data transfer in autonomous vehicles. Serializer/deserializer (SerDes) devices transfer large amounts of data in one direction and are for transferring information from a network of sensors and cameras to an in-vehicle processing unit. After that, the device creates



instruction sets necessary for autonomous vehicle operation. Several competing automotive SerDes standards are vying for primacy, including ASA's ML, MIPI's A-PHY and Analog Device/OpenGMSL's Gigabit Multimedia Serial Link (GMSLTM). Teledyne LeCroy is involved with all

those standard-setting organizations. Teledyne LeCroy's QPHY2-ASA compliance test software for ASA Motion Link v1.1 benefits from Teledyne LeCroy's and early ASA ML standards committee and plugfest involvement. The compliance test software anticipates testing requirements based

on what ASA member companies are in the process of finalizing and is available early in the ASA ML v1.1 adoption curve. The QPHY2-ASA software is supported on high-resolution high-bandwidth oscilloscopes – the WaveMaster 8000HD series – which provides as much as 65 GHz of bandwidth with 12 bits of resolution for current automotive SerDes baud rates and provides capabilities to test future, faster baud rates as ASA ML continues to evolve. For more information contact Teledyne LeCroy online at www.teledynelcroy.com/serialdata/in-vehicle-networks#ee.

EYEBROW

► **AC-DC power supplies for RF amplifiers, test, and industrial equipment introduced by TDK**



TDK-Lambda Americas Inc. in San Diego is introducing the HWS3000G 3000-Watt programmable AC-DC power supplies for test and measurement, semiconductor fabrication, RF amplifiers, laser machining, printing, and industrial equipment. The nominal output voltages and output currents are programmable (CV/CC) from zero to their maximum rating. These models have an /HD option for board coating and the ability to meet MIL-STD-810G shock and vibration in harsh environments. The /RF

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PS Form 3526-R, July 2014

option to reverse the airflow direction. The HWS3000G power supplies can deliver 1500 Watts with a low-line single-phase input voltage of 85 to 132 Volts AC and 3000 Watts at a high-line of 170 to 265 Volts AC. Four nominal output voltages, 24, 48, 60 and 130 volts, can be programmed to provide 0 to 28.8, 0 to 52.8, 0 to 66, and 0 to 156 volts. As many as three units can be connected in series, or 10 units in parallel. Users can program and monitor output voltage slew rate digitally, along with information on cumulative operating time, fault log, and product identification information. Digital programming is without turning the power supply on. Output programming happens using a serial RS485 interface (MODBus protocol) or analog 1-to-5-volt or 4-to-20-milliamp signals. These compact products also feature variable-speed fan with typically 45 decibels of audible noise at less than 70 percent load, and a 25-degree-Celsius ambient temperature. For more information contact TDK Lambda Americas online at www.us.lambda.tdk.com. ◀

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◀ The FAA is considering machine autonomy for self-driving jet bridges, aircraft tugs, baggage carts, snow removal and de-icing equipment, lawn maintenance vehicles, and shuttle services for employees and passengers.

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FAA approaches industry for autonomous ground vehicle systems for airports

BY Jamie Whitney

WASHINGTON—U.S. The Federal Aviation Administration (FAA) in Washington is asking for industry's help on the design, testing, and integration of autonomous ground vehicle systems (AGVS) at airports, as the demand for automation in aviation operations continues to grow.

The FAA issued two guidance documents, Part 139 CertAlert 24-02 and Emerging Entrants Bulletin 25-02, that provide direction for airport sponsors interested in testing driverless systems. These publications are part of a wider effort to evaluate the operational benefits, risks, and standards needed as autonomous technologies move from demonstration to day-to-day use at airports.

The FAA notes that AGVS technology is being considered for a wide range of tasks traditionally performed by human operators, including self-driving jet bridges, aircraft tugs, baggage carts, snow removal and de-icing equipment, lawn maintenance vehicles, and shuttle services for employees and passengers.

The FAA's Airport Technology Research and Development Branch has been directed by the Office of Airports Safety and Standards to study the performance of AGVS in movement areas, safety areas, and non-movement areas. Research will focus on system reliability, communications, and safety in active airport environments where autonomous vehicles must operate near aircraft, ground crews, and other service equipment.

The agency is asking for responses from two key groups: designers and manufacturers of AGVS technology, and airport sponsors or stakeholders already operating or planning demonstrations. Information collected will be used to assess the maturity of the technology, identify challenges, and shape future minimum standards and operational guidance.

Key areas of interest include remote monitoring and control, object detection and obstacle avoidance, integration of sensors such as LiDAR, radar, and cameras, redundancy in navigation systems, wireless communications requirements, and cybersecurity protections. The FAA also seeks details on emergency shut-off procedures, vehicle responses to lost communications links, operating limits

under adverse weather conditions, and how autonomous vehicles interact with human-driven vehicles, aircraft, and emergency response teams.

By gathering this information, the FAA says it aims to keep pace with rapid advances in automation and ensure that

safety, security, and operational efficiency remain central as autonomous systems become part of the airport ecosystem. The agency also highlights potential impacts on airport security and passenger experience as driverless vehicles move closer to deployment.

The FAA asked for responses by September. The primary point of contact for this RFI is Karen Thorngren who can be reached at karen.c.thorngren@faa.gov. More information is available at <https://sam.gov/workspace/contract/opp/16aacf-7c44ae4d99b886accbec2ad123/view>. ◀

NASA seeks industry input on lunar and Mars fission power system for 2030 launch

BY Jamie Whitney

CLEVELAND—The National Aeronautics and Space Administration's (NASA) Glenn Research Center in Cleveland is seeking industry's advice on a potential fission surface power (FSP) system to provide sustainable power for future lunar and Mars missions.

The effort supports the agency's initiative to return humans to the moon and eventually send the first American astronaut to Mars. NASA wants industry advice on a system that can produce at least 100 kilowatts of electrical power, weigh less than 15 metric tons, and uses a closed Brayton cycle power conversion system to convert heat to electricity. The system is to be ready for launch by fall 2029.

NASA intends to operate the FSP system on the lunar surface near human-rated landers, rovers, and pressurized habitats that enable continuous power even in areas without sunlight and during lunar nights that last more than 14 Earth days.

The agency recently announced plans to put a nuclear reactor on the moon by the mid-2030s to support lunar exploration, power generation on Mars, and strengthen U.S. national security in space.

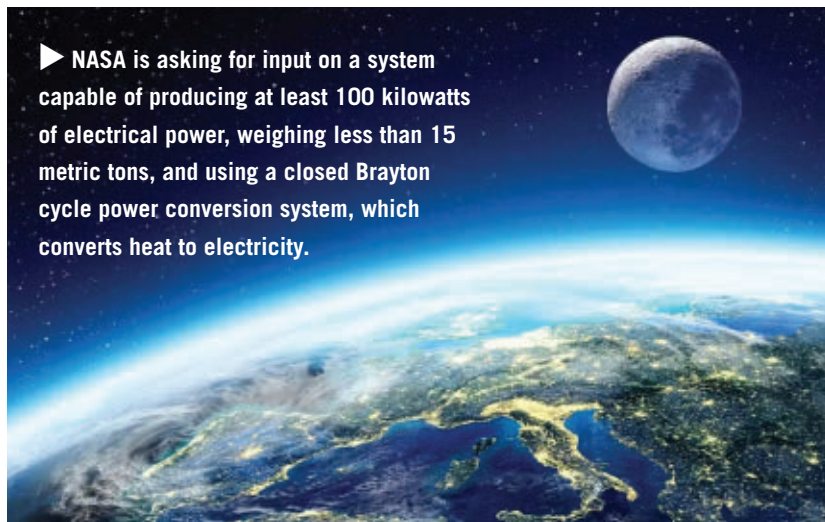
▶ **NASA is asking for input on a system capable of producing at least 100 kilowatts of electrical power, weighing less than 15 metric tons, and using a closed Brayton cycle power conversion system, which converts heat to electricity.**

The NASA request for information invites companies to share their interest and capabilities in providing the full end-to-end service—from development, testing, and transportation through launch, landing, deployment, and sustained operation—or to identify specific portions they could perform.


NASA is also asking industry to outline the level of agency support that may be required, such as access to special nuclear materials, test facilities, technical expertise, or launch services. Respondents are encouraged to identify risks to meeting the 2030 readiness date, including technical, programmatic, regulatory, and supply

chain challenges. Additional feedback is sought on relevant commercial or government standards, potential capability gaps, and the benefits or drawbacks of providing related services such as communications support or thermal management.

The program is managed at Glenn and funded by NASA's Exploration Systems Development Mission Directorate moon to Mars Program. Responses to the RFI were due by 5 p.m. EDT on 21 August 2025. This RFI's primary point of contact is Matthew Evans, who can be emailed at matthew.t.evans@nasa.gov. More information is available at <https://sam.gov/workspace/con>. ◀



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◀ This effort aims to enhance controller pilot data link communications in tower and en route airspace, maintain a high-reliability VDL-2 network, and transition toward Internet Protocol-based systems.

FAA seeks industry feedback on future domestic datalink services

BY **Jamie Whitney**

WASHINGTON—The Federal Aviation Administration (FAA) is conducting market research for its planned Domestic Datalink Services (DDLS) program, seeking industry input on capabilities, architectures, and potential innovations for the next generation of air-ground data communications.

The DDLS initiative follows decisions made at the International Civil Aviation Organization's Aeronautical Navigation Commission 11th meeting, where the FAA began a harmonization effort with Eurocontrol under the Future Communications Study to explore a unified direction for future air traffic control (ATC) air/ground communications.

Results so far indicate the United States will continue to use the very high frequency (VHF) spectrum for domestic ATC communications, which the FAA expects will satisfy operational needs beyond 2030.

Current ATC datalink operations in the United States use commercial networks, including Future Air Navigation Services (FANS) for oceanic control and the Aircraft Communications and Reporting System (ACARS) for pre-departure clearance in some terminal environments. The FAA's communications roadmap accommodates user preferences for existing VHF capabilities and assumes VHF Digital Link (VDL) Mode 2 technology will continue to support domestic data communications.

The DDLS program will sustain and enhance Controller Pilot Data Link Communication (CPDLC) in tower and en-route environments, operating within the FANS framework and meeting requirements in the FAA's Data Communications Network Service Description. The effort is intended to maintain a robust VDL-2 network with at least a 99.5 percent uplink success rate, integrate with the FAA National Airspace Security Gateway, and provide a path toward the Next-Generation Air

Transportation System (NextGen) and possible future Internet Protocol-based communications.

The FAA is seeking feedback on solutions for switching from ACARS to the Internet Protocol Suite for CPDLC while minimizing operational impact, ensuring avionics interoperability, improving performance monitoring, reducing outages, and strengthening cyber security. Industry input is also requested on cost control, competition strategies, and emerging air/ground technologies that could improve efficiency or reduce life cycle costs over a five- to seven-year performance period.

The FAA requested responses by last September. The primary point of contact for this solicitation is Pearl Winston, who can be emailed at pearl.a.winston@faa.gov. The FAA anticipates a formal solicitation in 2027. More information, including technical details, is available at <https://sam.gov/workspace/contract/opp/37e53ef-dabc64796b3c71a59c3e9043b/view>. ◀



Viasat to support commercial-military hybrid space network for resilient communications

▲ The Hybrid Space Architecture, or HSA, is intended to enhance warfighter connectivity, situational awareness, and decision-making by enabling secure, multi-path communications across commercial and government networks. Viasat image

BY **Jamie Whitney**

CARLSBAD, Calif.—Viasat Inc. in Carlsbad, Calif., will prototype and demonstrate technologies for the Hybrid Space Architecture program, a Department of Defense (DOD) initiative to integrate commercial, civil, and military space assets into a unified and resilient communications network.

The Hybrid Space Architecture, or HSA, is to enhance warfighter connectivity, situational awareness, and decision-making by enabling secure, multipath communications across commercial and government networks. The program is led by the Defense Innovation Unit and U.S. Space

Systems Command, in coordination with other DOD agencies and combatant commands.

Viasat will conduct prototype demonstrations over the next year in the U.S. Indo-Pacific, European, Central, and South Command areas of responsibility, with some activities beginning as early as this summer.

Under its Defense and Advanced Technologies segment, Viasat's Resilient Space Missions team will focus on demonstrating inter-Network Maneuvering, a capability that allows seamless roaming across government and commercial networks. This supports interoperability objectives outlined in the U.S. Space Force's Commercial Space

Strategy, Doctrine Document, and Space Warfighting Framework.

Viasat will use its NetAgility software-defined networking platform to enable real-time, dynamic routing of communications across multiple satellite orbits and vendor systems. The platform leverages real-time mission and network situational awareness to inform intelligent network selection and orchestration, aiming to maintain continuous space-based connectivity.

The HSA project uses agile acquisition methods to support the rapid integration, testing, and validation of commercial technologies, with the goal of piloting an operational hybrid commercial and government space architecture by 2026. ◀

GE Aerospace, Merlin team on AI-powered autonomy for military and civil aircraft

GE Aerospace in Cincinnati and Merlin Labs, a developer of autonomous flight technology in Boston, announced a joint effort to develop a next-generation autonomy and pilot-assist platform. The platform will introduce artificial intelligence (AI)-enabled capabilities to existing and future military and civil aircraft, enabling crew reduction and supporting uncrewed flight operations. GE Aerospace's Flight Management System already operates on more than 14,000 aircraft worldwide, providing an opportunity to integrate Merlin's autonomy software into legacy military platforms. The autonomy core aims to become the system of record for high-assurance aerial systems, enabling single-pilot operations (SPO) and reduced crew workload. The initiative combines GE Aerospace's expertise in flight management and open system architecture with Merlin's autonomy software, avionics packages, and data-link solutions to deliver a scalable, certifiable solution for SPO and uncrewed flight. Matt George, CEO of Merlin, said the collaboration enables quick deployment of autonomy capabilities across multiple platforms, expanding customer reach and boosting revenue growth. The KC-135 Center Console Refresh program is the first opportunity to introduce the autonomy core, addressing aging cockpit components and sustaining the Air Force's refueling fleet. Merlin already has agreements with the Air Force Materiel Command to integrate autonomy onto the KC-135, a first step toward uncrewed operations. Expansion is

expected across transport, refueling, and civil aviation.

Voyager selects Vivace to build primary structure for Starlab commercial space station

Vivace Corp. in Huntsville, Ala., will manufacture the primary structure for Starlab, a next-generation, artificial intelligence (AI)-enabled commercial space station designed to ensure continued human presence in low-Earth orbit, announced Voyager Technologies Inc. in Denver, the majority holder of Starlab Space LLC. The Starlab station will be one of the largest space-flight structures ever developed. Vivace will collaborate with Starlab and international partners to complete the design-to-manufacture process and initiate production of the structure. Starlab notes that the National Aeronautics and Space Administration (NASA) has awarded more than \$217.5 million to the Starlab program. Starlab is designed to create long-term opportunities in the commercial space sector by providing a platform for in-space research, technology demonstrations, and advanced materials development. Following its investment phase, the program aims to generate sustained revenue through government, international, and commercial partnerships. Starlab Space is a U.S.-led joint venture among Voyager Technologies, Airbus, Mitsubishi Corp., MDA Space, and Palantir Technologies, with strategic partners including Hilton, Northrop Grumman, and The Ohio State University. The station is intended to provide a seamless transition from the International Space Station and maintain a continuous human presence in low-Earth orbit.

NASA seeks turbine air motors for wind tunnel propulsion testing

The National Aeronautics and Space Administration's (NASA) Glenn Research Center is requesting industry quotes for four turbine air motors (TAMs) to support propulsion-airframe integration testing at the Ames Research Center 11-by-11-foot Unitary Plan Wind Tunnel in California. The acquisition is being conducted under solicitation number 80GRC025Q0001. Proposals were due in September. The procurement will provide two primary turbine motors and two backup units that will be mounted on an airframe body-and-wing model for aerodynamic performance studies at high-speed cruise conditions. According to NASA, the specifications are designed to ensure that the motors are compact, adaptable, and capable of supporting a wide range of propulsor configurations. NASA's requirements emphasize flexibility and reliability to avoid the time and cost of designing new powered propulsion hardware. The turbine air motors must be able to operate in isolated and installed testing, as well as in upright or inverted orientations, to accommodate different mounting systems. They also must be capable of running in multiple wind tunnel facilities, provided a suitable power source is available, whether electric, pneumatic, or hydraulic. Offers are due to Kevin Carroll at NASA Glenn Research Center, who can be reached at kevin.m.carroll@nasa.gov. More information is available at <https://sam.gov/workspace/contract/opp/71ca2e6240d94d77a-0fa9cfe67f7bc2f/view>. ◀