

READ THE DIGITAL EDITION

ANYTIME, ANYWHERE, ANYWAY YOU LIKE

At your desk or in the field, our digital edition makes it easier than ever to read important content wherever you go.

▶ **EASIER TO READ**

Flip through pages one at a time or enlarge them to go easy on your eyes.

▶ **WORKS ON ANY DEVICE**

The new responsive design lets you access it on your smartphone, tablet or desktop.

▶ **PUTS YOU IN CONTROL**

Interactive table of contents
Lets you choose exactly what you want to read.

Page View

Simply toggle between Page View or Reading View using the toggle button on the top right of page.

Digital Archive Library

Click the button on the top left of page to view all previous issues.

Download or Print

Share with your colleagues or save for yourself.



Military+Aerospace Electronics®

Subscribe at www.militaryaerospace.com/subscribe
and check out our digital edition today!

OCTOBER 2022

Military+Aerospace Electronics®



COUNTER-UAS TECHNOLOGIES

Technologies safeguard sensitive perimeter security for airports, military bases, nuclear power plants. PG. 18

HARNESS TECHNOLOGY'S CUTTING EDGE FOR A COMPETITIVE EDGE

The climate of continuous urgency in the geopolitical environment is escalating demand for faster, more powerful and secure aerospace and defense (A&D) systems. From data to decision, silicon to systems, customers entrust their mission-critical challenges to Mercury. Our trusted, secure, end-to-end processing platform leapfrogs incremental gains, bending the curve to power the most critical A&D missions on the planet and beyond.

mrcy.com/processing-platform



Features

- 18 SPECIAL REPORT**
Counter-UAS technologies take-on military threats
Enabling technologies for counter-UAS technologies help safeguard sensitive perimeter security tasks for airports, military bases, nuclear power plants, and more.
- 26 TECHNOLOGY FOCUS**
Thermal-management techniques take-on the heat
Hot components like processors and power-management devices require advanced electronics-cooling designs to help today's aerospace and defense electronics keep performance at its peak.
- D1 DIGITAL EXCLUSIVE**
Commercial Aerospace
www.militaryaerospace.com/subscribe

Columns

- | | |
|------------------------------|--------------------------------|
| 2 TRENDS | 36 UNMANNED VEHICLES |
| 4 NEWS | 40 ELECTRO-OPTICS WATCH |
| 14 IN BRIEF | 43 PRODUCT APPLICATIONS |
| 34 RF & MICROWAVE | 46 NEW PRODUCTS |

FOLLOW US



FACEBOOK.com
[/MilitaryAerospaceElectronics](https://www.facebook.com/MilitaryAerospaceElectronics)



TWITTER
[@MilAero](https://twitter.com/MilAero)



LINKEDIN.com
[/showcase/military-aerospace-electronics](https://www.linkedin.com/showcase/military-aerospace-electronics)

Cover photo: Army photo

Integrated Systems that Raise the Bar



LCR Embedded products meet the most demanding mission objectives for VPX and SOSA™ aligned payloads.

Integrated Systems

Rugged Chassis

High Speed Backplanes



LCR EMBEDDED SYSTEMS

lcrembeddedsystems.com
(800) 747-5972

SOSA
Sensor Open Systems Architecture
MEMBER

OpenVPX

Military & Aerospace Electronics® (ISSN 1046-9079, print; 2688-366X, digital / USPS 005-901) is published 12 times a year by Endeavor Business Media, LLC, 1233 Janesville Avenue, Fort Atkinson WI 53538. Periodicals postage paid at Fort Atkinson, WI 53538 and at additional mailing offices. SUBSCRIPTION PRICES: USA \$171 1yr., \$280 2yr.; Canada \$198 1 yr., \$320 2 yr.; International \$224 1 yr., \$360 2 yr.. POSTMASTER: Send address corrections to Military & Aerospace Electronics, P.O. Box 3257, Northbrook, IL 60065-3257. Military & Aerospace Electronics is a registered trademark. © Endeavor Business Media, LLC 2022. All rights reserved. Reproduction in whole or in part without permission is prohibited. We make portions of our subscriber list available to carefully screened companies that offer products and services that may be important for your work. If you do not want to receive those offers and/or information via direct mail, please let us know by contacting us at List Services Military & Aerospace Electronics, 61 Spit Brook Rd., Suite 501, Nashua, NH 03060. Printed in the USA. GST No. 126813153. Publications Mail Agreement no. 875376.

U.S. hypersonics weapons development takes big step forward with HACM development contract



BY John Keller
EDITOR IN CHIEF

The U.S. Air Force is moving ahead with developing hypersonic munitions for its fleet of combat aircraft to attack high-value enemy targets such as large surface warships, mobile ballistic missile launchers, and strategic command posts.

Last month the Air Force Life Cycle Management Center's Armament Directorate at Eglin Air Force Base, Fla., announced a \$985.3 million task order to the Raytheon Missiles & Defense segment in Tucson, Ariz., to design and develop the Hypersonic Attack Cruise Missile (HACM).

This air-launched hypersonic cruise missile, which initially will be carried on jet fighter-bomber aircraft like the Lockheed Martin F-35, the Boeing F-15EX and the Boeing F-15E Strike Eagle aircraft, is a scramjet-powered hypersonic weapon designed to hold high-value targets at risk in contested environments from standoff distances, Air Force officials.

Hypersonic munitions maneuver through the air at speeds of at least Mach 5, which is 3,836 miles per hour. Some hypersonic munitions under development are expected to fly much faster. Raytheon and team member the Northrop Grumman Defense Systems segment in McLean, Va., will deliver operationally ready HACM hypersonic cruise missiles to the Air Force.

HACM, a relatively small and inexpensive system, is one of two Air Force projects pursuing hypersonic munitions; the other is the Lockheed Martin AGM-183 Air-Launched Rapid Response Weapon (ARRW). HACM uses air-breathing engine technology for propulsion, while ARRW is a boost-glide weapon that is fired into the atmosphere and uses the energy from its rocket to fly toward its target.

It isn't just the Air Force that is pursuing hypersonic munitions development. The U.S. Navy is working on the Offensive Anti-Surface Warfare Increment 2 (OASuW Inc 2), also known as Hypersonic Air-Launched OASuW (HALO). The U.S. Army is working on the Long-Range Hypersonic Weapon (LRHW), while the U.S. Defense Advanced Research Projects Agency (DARPA) is working on the Tactical Boost Glide (TBG) project, the Operational Fires (OpFires) project, and the Hypersonic Air-breathing Weapon Concept follow-on (MoHAWC).

As of now, the Air Force HACM probably is the nearest U.S. hypersonic weapon to deployment. HACM is under development by the Raytheon-Northrop Grumman team, and is expected to be one of the first hypersonic cruise missiles to be in the U.S. inventory.

The HACM scramjet engines will use high vehicle speed to compress incoming air forcibly before combustion, which enables sustained flight at hypersonic speeds, which will enable the munition to reach their targets more quickly than similar traditional missiles, and potentially evade air defenses.

In 2020, the U.S. Air Force joined Australia in a multi-year project called the Southern Cross Integrated Flight Research Experiment (SCIFiRE) to develop air-breathing hypersonic cruise missile prototypes.

Through SCIFiRE, the U.S. and Australia will continue collaborating on HACM design and development, including using Australian test sites for the initial all-up-round flight tests. The Air Force plans to deliver a HACM capability with operational utility by 2027. ◀

Introducing **Kite-Strike II** Next-Gen Edge AI Computing

Kite-Strike II is the future of edge AI computing. Integrating the **NVIDIA Jetson AGX Orin**, the world's most powerful AI computer for edge-deployed autonomous machines, Kite-Strike II is a small-form-factor embedded mission computer, **fully rugged and highly configurable** for any requirement in any environment. MIL-SPEC Rugged. SWaP-Optimized. Single LRU. MOSA. GCIA.



Product Introduction 10.10.2022
See it at AUSA 2022 Systel Booth 1733

#ksii
#jetsonorin
#systelatausa
#systelrugged
sales@systelusa.com
systelusa.com/products/kite-strike-ii



2022 Military & Aerospace Technology Innovators Awards announced

NASHUA, N.H. – Military & Aerospace Electronics has announced the 2022 Technology Innovators Awards to recognize companies offering substantial military, aerospace, and avionics design solutions.

Awards are in three tiers — ranging from platinum, the highest, to the gold awards, and finally to the silver awards — and are based on the recommendations of an independent panel of industry judges.

Platinum honorees

The 2Mb Rad Hard SPI F-RAM space memory from Infineon Technologies in Neubiberg, Germany, is a radiation-hardened serial interface F-RAM with 2Mb density non-volatile storage for extreme environments. QML-V qualified for space applications, the new devices deliver infinite endurance, instant non-volatile write technology, and longer than 100-year data retention. As a direct replacement for serial NOR flash and EEPROMs, the rad hard F-RAM is ideal for data logging of mission critical data, telemetry storage, and command and control calibration data storage.



The ADAR4002 0.5-to-19 GHz Broadband Bi-Directional Single Channel True Time Delay from Analog Devices Inc. in Wilmington, Mass., is a very-low-power broadband bi-directional single-channel true time delay unit (TDU) and a digital step attenuator (DSA). It contains a programmable step attenuator and programmable time delay for beam steering and

draws less than 1 milliwatt of power. Not only is there a high degree of RF integration in this TDU, but there also is a sophisticated digital definition that has memory to support quick and efficient beam state selection via program control over the SPI bus as well as incorporating a serial interface for satellite communications (SATCOM), radar, electronic warfare (EW), and signals intelligence (SIGINT).

The LYNX MOSA.ic for Avionics from Lynx Software Technologies in San Jose, Calif., is a software framework for building and integrating complex multi-core safety- or security-critical systems using independent application modules.

Continued on page 8



RF and Microwave Antennas In-Stock

Your Source for RF & Microwave Antennas

Fairview Microwave RF and microwave antennas are used in many different applications across multiple industries. Some of the common uses include PCS / cellular networks, base stations, land mobile radio (LMR) applications, GPS systems, critical response communication, ISM, WiFi, public safety, homeland defense, SCADA and many others. We carry hundreds of antennas and accessories including directional antennas, omni directional antennas and various antenna mounts such as magnetic and non-magnetic NMO mounts.

Place your order by 6 PM CT, and have your antennas or any other components shipped today.

In Stock & Shipped Same-Day

fairviewmicrowave.com
+1 (800) 715-4396

 **Fairview Microwave®**
an INFINITE brand



X9 SPIDER

THE WORLD'S SMALLEST

BATTLEFIELD MISSION SYSTEM

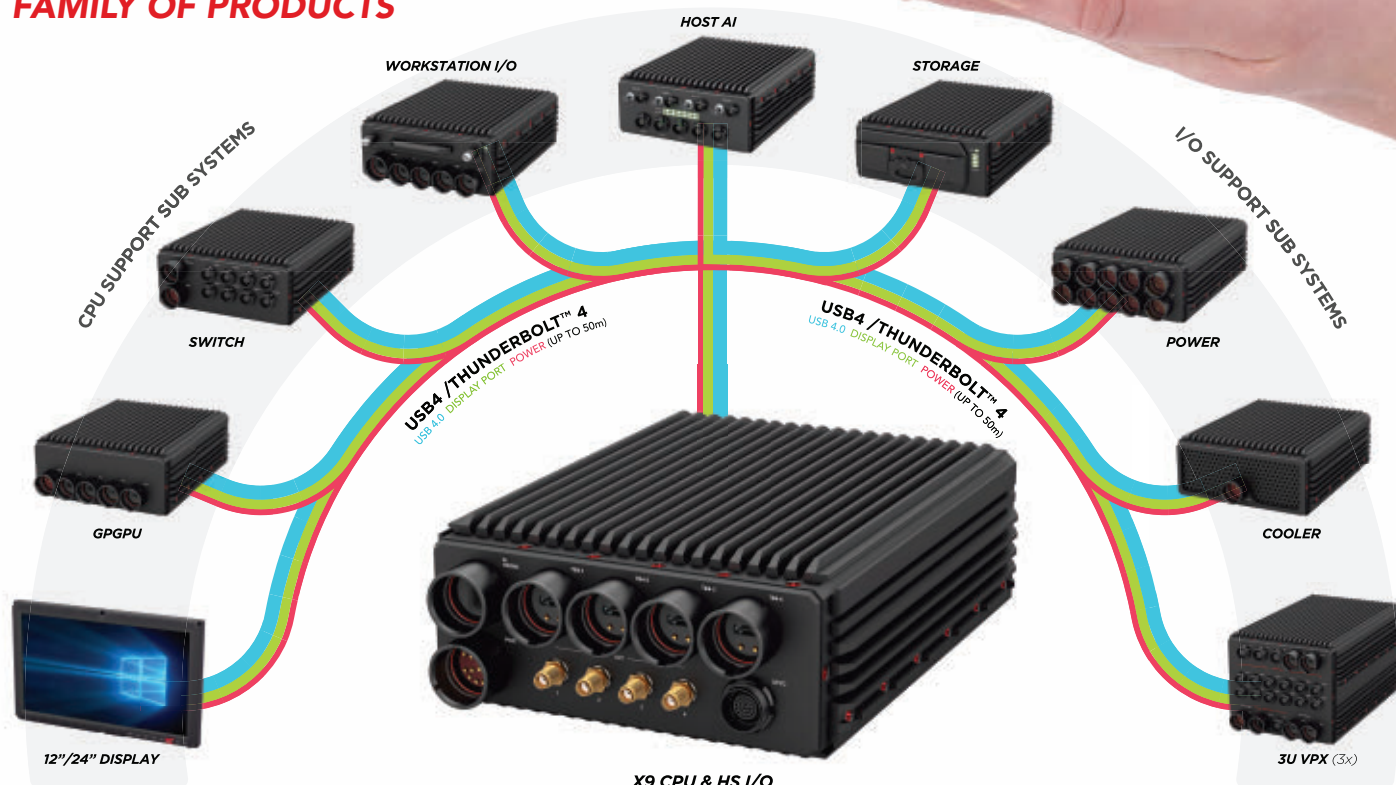
WITH FULLY FEATURED CPU, GPU, STORAGE & HIGH SPEED I/O

HOST CPU FEATURES

- Intel® Xeon® W up to 8 cores (Tiger Lake)
- 64GB DDR4 ECC DRAM
- 4x Thunderbolt™ 4 with Display Port and 100W per port
- NVIDIA® RTX-5000 GPGPU (PCIe Gen4)
- Dual 100GigE Ethernet ports with Fiber Interface
- Quad M.2 sites to support Wi-Fi, Mil STD-1553, Cell and GPS
- Dual M.2 80mm for high performance SSD



X9 SPIDER DISTRIBUTED SYSTEM FAMILY OF PRODUCTS



X9 DISTRIBUTED SYSTEM ADVANTAGE

The X9 modular, scalable, distributed architecture simplifies applications that require rugged high-performance computing, high-definition video, sensor processing, artificial intelligence (AI) battlefield edge processing, storage, display, and I/O in a small, rugged enclosure with amazing performance per dollar per Watt. All X9 products are modular, expandable or scalable, with Thunderbolt™ 4 technology and our patented LightBolt™ 40Gbps connections in copper or fiber, with optional 100W per port power for up-/down-stream sensors and system expansion.



All General Micro Systems, Inc products are proudly designed and manufactured in the U.S.A.

CONTACT US TO LEARN MORE ABOUT THE FUTURE OF DISTRIBUTED COMPUTING

GMS

GENERAL MICRO SYSTEMS, INC.

800-307-4863 / GMSINC.COM

X9 SPIDER

BY GENERAL MICRO SYSTEMS



COMMUNICATION
SYSTEMS

NUIS/VIDEO
PROCESSING

BLUE FORCE
TRACKING

SMART SENSOR
PROCESSING

FITS IN
BACKPACK

HEALTH
MONITORING

**THE WORLD'S MOST POWERFUL
FULL-FEATURED WEARABLE COMPUTER**

LESS THAN 3 POUNDS!



S1502-MANPACK

- Intel® Xeon® W with 64GB DDR4 ECC DRAM
- 4x Thunderbolt™ 4 with DisplayPort and 100W power
- Thunderbolt™ 4 available as copper or fiber cable with power
- NVIDIA® RTX5000 GPGPU for real-time tip-of-spear image and sensor processing
- Dual 100GigE ports with fiber for at-halt command post connectivity
- Quad M.2 to support Wi-Fi/Bluetooth, MIL-STD 1553, Cellular and GPS
- Dual M.2 high performance SSDs for up to 40TB of data storage
- 3-Axis MEMS accelerometer for Position/Navigation/Timing (PNT)
- Shock, temperature and tamper sensors for safe operations
- Features intelligent CoolTouch™ cooling for optimal comfort and battery life
- Operates via soldier batteries or single +24 VDC



SCAN TO LEARN MORE ABOUT
THE X9 FAMILY OF PRODUCTS

GMS
COMPUTING ENGINES

GMSINC.COM / (800) 307-4863

Continued from page 4

It aims to solve the many issues plaguing embedded software architectures. Founded on the LynxSecure separation kernel hypervisor, LYNX MOSA.ic supports a variety of operating systems such as Linux, Windows, third-party RTOSes (including competitor OSes) and bare metal applications such as Lynx Simple Applications (LSAs).

The Tactical Technologies Toolset (T3) from Fuse Integration Inc. in San Diego is a remote network monitoring and management tool with a flexible, web-based user interface (UI) and data lake functionality. Made to monitor and manage multiple networks, data links, and radar connections, T3 provides key insights and powerful diagnostics at the end-user's fingertips. T3's data lake capabilities allow for advanced analytics and long-term systems analysis, increasing readiness and enabling data-driven decisions.

The Ruggedized QCL-IR Systems for Infrared Countermeasures from DRS Daylight Solutions in San Diego is a high-power, multi-color laser system for military applications such as directional infrared counter measures (DIRCM). Previously, DIRCM systems only were installed on large aircraft, yet the minimal SWaP of these lasers enable DIRCM

deployment on lightweight helicopters and fixed-wing aircraft. The QCL-based DIRCM lasers are designed using commercial technologies integrated into a modular architecture.

The RedHawk KVM-RT real-time software from Concurrent Real-Time in Pompano Beach, Fla., uses the features of the RedHawk Linux host for memory management, process scheduling, device access and I/O. Where several computers once were needed to provide real-time modeling, simulations and applications, one computer is needed with KVM-RT. This means a purchase order for six computers can turn into one, drastically reducing the energy, e-waste, and space footprints of the system.

The helux MORA Software & Firmware Integration Toolkit from Sciens Innovations, LLC in York, Pa., was created to ease the development of Modular Open Radio Frequency Architecture (MORA) and Vehicle Integration for C4ISR/EW Interoperability (VICTORY)-standard applications for Sensor Open Systems Architecture (SOSA)-aligned VPX hardware while expediting SOSA adoption within the CMOSS community. The toolkit includes software libraries, HDL modules, and UI tools that address SOSA and software-defined radio (SDR) requirements.



Advanced Lighted Pushbutton
Switches and Indicators

Manufactured by
Applied Avionics



There's Never Been a Better Time to Make the Switch

VIVISUN® has set the standard in ruggedized MIL-SPEC avionics switches and indicators for more than 50 years. With advanced internal NEXSYS® component options, our products simply outperform the competition.

If you're looking for personal customer service, worldwide factory support and the industry's fastest delivery, it's time that you make the switch to VIVISUN, manufactured by Applied Avionics.

Speaking of making the switch, our easy-to-use Part Configurator allows you to design a switch and get a complete part number 24/7 as part of our online paperless ordering process.

Ready to make the switch? Visit our website at:

www.AppliedAvionics.com/VIVISUN

Sales and Support: +1 (888) 848-4786



WHEN IT HAS TO WORK, THINK AXIOM ELECTRONICS



Military, avionics and aerospace hardware must function flawlessly in challenging environments. Robustness of the manufacturing process is a critical step in achieving that goal. Axiom Electronics assembles and tests complex circuit boards and complete systems for mission critical products, supporting our customers' needs for prototype, pilot run and production builds. Our supply chain management and engineering teams work together to identify availability or obsolescence issues during project transition. We can work from your designs using mature or newly-introduced technologies, building to virtually any standards and specifications you choose. From Earth to Mars, our manufacturing expertise is helping our customers deploy mission critical products.

Our registrations include ITAR, ISO 9001:2015 and AS 9100D.

If you are looking for a contract manufacturer expert in supporting the rigorous requirements inherent in military and aerospace hardware, give us a call at **503-643-6600** or visit our website at **www.axiomelectronics.com**.

To learn more about our manufacturing processes download our latest whitepaper, "*Critical Factors in Ensuring Solder Joint Integrity*" at **www.axiomelectronics.com/mae**.



The 3U VPX M4154 Air Flow Through (AFT) DC-DC Power Supply from Milpower Source Inc. in Belmont, N.H., is a air-cooled DC-DC power supply that uses air flow through (AFT) cooling technology, which is compatible with the 3U 1.5-inch form factor defined in the ANSI/VITA 48.8 standard. The M4154 AFT power supply will enable integrators to achieve new levels of complexity while enabling improving SWaP. It capitalizes on mature circuit topologies coupled with the electrical layout to make the most of AFT technology.

The VPX3U-ORIN-CX7-SBC Blade Server from Wolf Advanced Technology in Whitchurch-Stouffville, Ontario, is for military and aerospace environments. This single-board computer uses an NVIDIA Jetson AGX Orin to bring an artificial intelligence (AI) computer for autonomous machines to the edge. The WOLF VPX3U-ORIN-CX7-SBC meets the needs of demanding C5ISR applications, providing a secure compute node that provides advanced AI and high-performance computing, high data transfer rates, and the cyber security features required to ensure data is being protected.

The High Efficiency Environmental Control Unit (ECU) For Military Environments from Advanced Cooling Technologies Inc. in Lancaster, Pa., is a high energy efficiency ratio (EER) ECU to minimize the electrical energy consumption for applications that require improved efficiency. The ECU employs techniques commonly used in commercial HVAC units, with a focus on the level of ruggedization required for military applications. It uses digital compressors, air economizers, and reduced pressure drop evaporator and condenser coils to create a ruggedized, military ECU that rivals some of the best commercial HVAC systems in energy efficiency.

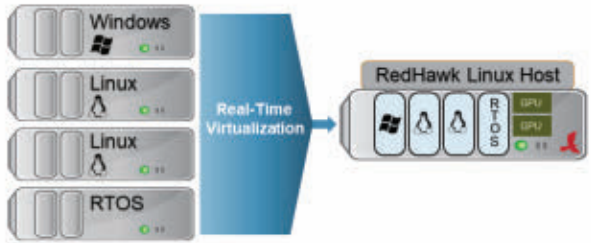
The Short VPX Payload Test Platform from Elma Electronic in Fremont, Calif., is designed to accelerate development and test of 3U boards intended to meet the Modular Open Standards Approach (MOSA) open-systems standard. One contender for the SOSA small form factor selection is Short VPX, an SFF initiative that continues to use OpenVPX backplanes but shortens the length of the 3U and 6U boards. Elma has developed a

Military+Aerospace Electronics

2022 Innovator awards

PLATINUM

RedHawk KVM-RT
Real-Time Virtualization for Mission-Critical Applications



Operational Flexibility Reduced Overhead
Disaster Recovery Centralization Scalability

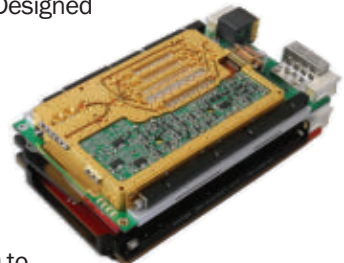
concurrent REAL-TIME

www.concurrent-rt.com/redhawk-kvm-rt

GOLD

3U Open VPX Transceiver, 100 MHz to 18 GHz
PTRAN-100M18G-SFB-3UVPX-10HP-MAH

This Transceiver operates over 0.1 - 18 GHz and fits into a 3U open VPX form factor utilizing the high-speed VITA 67 RF connector. Designed with Integrated Up and Down Converters; IF up to 4 GHz; Time Gated SDLV for Pulse Blanking; -80 to -10 dBm Input Dynamic Range; Customizable Switched Filter Banks; 0 to +10 dBm Transmit Power; 100 ns Switching Speed; CW Immunity; and is made to attach to an FPGA controller card allowing for total solution in a 10HP (2") form factor.



Quantic PMI
PLANAR MONOLITHICS

www.pmi-rf.com

Short VPX payload test & development platform to help accelerate the deployment of boards designed for use in this new small form factor.

The Parvus DuraCOR Pi Raspberry Pi Mission Computer from Curtiss-Wright Defense Solutions in Ashburn, Va., features a Raspberry Pi and its ecosystem with associated OSes, toolsets, and frameworks. The DuraCOR Pi is small enough for platforms that requires a SWaP-sensitive implementation. It's even small enough to be wearable. The DuraCOR Pi brings the Raspberry Pi ecosystem to a fanless IP67 design (dust and waterproof) that has undergone qualification testing per MIL-STD-810, MIL-STD-461, MIL-STD-1275, MIL-STD-704, and RTCA/DO-160 conditions for environmental, power, and EMI compliance.

The VSC Series from VPT Inc. in Blacksburg, Va., is a commercial off-the-shelf DC-DC converter developed for smaller satellites in low-Earth orbits (LEO), launch vehicles, and NASA Class D missions where the balance of cost and guaranteed

performance is critical. It is guaranteed for radiation tolerance in low-Earth orbits applications at an extremely competitive price point. The series is radiation tested to 42 MeV/mg/cm² and guaranteed to 30 MeV/mg/cm² for SEE and tested to 40 krad(Si) and guaranteed to 30 krad(Si) for TID in accordance with VPT's in-house radiation hardness assurance (RHA) plan.

The IADS Post Test Explorer from Curtiss-Wright Defense Solutions is a stand-alone data search, analytics, and visualization system for the flight test industry. It combines the tasks of searching for data, analyzing the data, and creating a report. Post Test Explorer enables the user to enter natural language search queries to find data of interest. Queries can be written as normal sentences rather than having to follow a precise syntax. The search engine can find items of interest in existing IADS data recordings, with future compatibility planned for other database files (CSV, etc.).

RecordFlux software from AdaCore in New York is a domain-specific language (DSL) and toolset for handling complex binary communication protocols and data formats. Using the RecordFlux Modeller, domain experts can express the intended format and behavior of protocols in a mathematically precise manner. At this step, it's not necessary to take programming language details into consideration – in fact, domain experts don't even need to know the target language. At the same time, the formal RecordFlux specification is expressive enough to serve as a central source of truth for a whole project.

The 2 Slot Rapid Rugged Test System from LCR Embedded Systems in Norristown, Pa., is an embedded computing chassis with the potential to serve as a development platform or a deployable system by offering multiple design features which enable rapid development to deployment transition in the same chassis for embedded systems. The intention of the expansion module is to enable easy access for testing and cable installation – development activities – in this deployment ready chassis. All cabling is deployment capable and the chassis is designed to meet MIL STD shock, vibration, thermal and ingress requirements.

The Rubidium signal generator family from Anritsu Company in Morgan Hill, Calif., covers the 9 kHz to 43.5 GHz frequency range, and has built-in at-location frequency and power calibration for emerging high-frequency military and aerospace applications. For use as signal simulators in radar design and test application, the Rubidium signal generator offers pulse modulation functionality that can simulate stationary and moving targets. It is also possible to simulate up to four targets, with its ability to generate as much as four pulses with varying delay and pulse widths within a pulse repetition period.



E18 Mechanical Incremental Encoder – Rugged Affordability

Elma's new E18 is designed so all programs can now add a rugged encoder with great turning feel at an affordable price.

The E18 offers a high-quality alternative for a drop-in, rugged encoder for harsh environments with a standard footprint, so a drop-in replacement or upgrade is possible. Options include IP67 sealing, stainless steel shafts, turning torques, # detents & resolutions – all delivered with Elma's well-known "Swiss-Click" turning feel.



ELMA
Your Solution Partner

www.elma.com

The HSR10 CSfC Certifiable 10 GbE NAS secure data storage system from Curtiss-Wright Defense Solutions is a COTS-based solution that can be deployed quickly and affordably to store data at rest. It is designed with two layers of full disk encryption (FDE). The NVMe drive is certifiable to the National Security Agency Commercial Solutions for Classified (CSfC) secure data storage standard for sensitive and classified data. CSfC program allows commercial products in layered COTS solutions, which can be fielded quickly.

Gold honorees

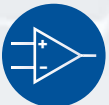
Bedrock Automation, BEDROCK OSA; RGB Spectrum, Zio 2 Networked Video Solution; Mercury Systems, Model 5585 FPGA 3U Module; MPLAG Switzerland, Mission Control Computer with Intel ATOM x6425E CPUs in IP67 Housing; Mercury Systems, EnsembleSeries HDS6705; Curtiss-Wright Defense Solutions, PacStar VPX Smart Chassis; Elma Electronic, E18 Mechanical Incremental Encoder; New Wave Design and Verification, V1160 Dual-Port 100G Rugged Ethernet XMC Card; Mercury Systems mPOD Electronic Attack Training System; Planar Monolithics Industries Inc., PTRAN-100M18G-SFB-3UVPX-10HP-MAH,

Transceiver, 100 MHz to 18 GHz; Tektronix Inc., 2 Series Mixed Signal Oscilloscope (MSO); Curtiss-Wright Defense Solutions, VPX3-E320 Ruggedized Universal SDR; Princeton Infrared Technologies Inc., 1280BPCam; Annapolis Micro Systems, WILD FMC+ DME1 ADC & DAC Card; Palomar Technologies, Palomar 3880-II Die Bonder.

Silver honorees

Curtiss-Wright Defense Solutions, V3-1708 High-Performance DAL-A Single Board Computer; Elma Electronic, NetSys-5312; Lemo Corporation, LEMO M Series High Power connector; Neosys Technology Inc., Neosys RGS-8805GC Rugged HPC Server; Mercury Systems, RFS1140 RF System-in-Package; Interface Concept, ComEth4420a - 3U VPX Dual-Plane Gen3/4 PCIe & 40 Gigabit Ethernet Switch; Signal Hound, SM435B mmWave Spectrum Analyzer; Mod Op, MaxUp LEADS (Lifecycle Enhanced Asset Decision Software); New Wave Design and Verification, V1161 Programmable 100G Rugged Ethernet XMC ACAP Card; Interface Concept, IC-INT-VPX3k; Curtiss-Wright Defense Solutions, XMC-528 Embedded Security Mezzanine. ←

HI-REL POWER ANALOG SOLUTIONS



Linear Amplifiers

Up to 50A Continuous Current
Up to 2500V Supply Voltage



PWM Amplifiers

Up to 200A Continuous Current
Up to 1200V Supply Voltage



Voltage References

Low Temperature Drift: 1ppm
Low Noise: As low as 1.5µV_{P-P}



- ✓ DLA MIL-PRF-38534 and ISO9001 certified, offering "M/883" compliant amplifier solutions
- ✓ Commercial/Industrial Grade and Non-Compliant "M" Grade products
- ✓ Reduce design time with Apex's broad portfolio of "off-the-shelf" and integrated solutions

apexanalog.com

APEX
MICROTECHNOLOGY
PRECISION • POWER • ANALOG

Raytheon to move Next Generation Jammer EW technologies toward deployment

BY John Keller

PATUXENT RIVER NAS, Md. — Airborne electronic warfare experts at Raytheon Technologies Corp. are moving enabling technologies developed for the U.S. Navy Next Generation Jammer-Mid Band (NGJ-MB) project closer to deployment.

Officials of Naval Air Systems Command at Patuxent River Naval Air Station, Md., has announced plans to ask the Raytheon Intelligence and Space segment in El Segundo, Calif., to conduct trade studies with the aim of moving NGJ-MB frequency coverage into the ALQ-249(V) 1 Next Generation Jammer Mid-Band pod.

The NGJ midband is an advanced electronic attack system that denies, disrupts, and degrades enemy communications and air-defense radar systems. It is built with a combination of agile active electronically scanned arrays (AESA) and an all-digital back end. The value of this order has yet to be negotiated.

The NGJ-MB helps the Growler electronic warfare (EW) aircraft operate at long ranges, attack several different targets simultaneously, use advanced electronic jamming techniques, and incorporate rapid upgrades through a modular, open-systems architecture. The Navy chose Raytheon to carry out NGJ-MB full-scale development in 2016.

The NGJ is a tactical electronic jammer pod that replaces the 40-plus-year ALQ-99 jammer system on the EA-18G — a version of the Navy's carrier-based two-seat F/A-18F Super Hornet jet fighter-bomber that is modified specially for electronic warfare.

Raytheon delivered the first NGJ-MB pod to the Navy for testing in July 2019. The technology also can scale to other missions and aircraft.

The EA-18G leads an airborne attack by disrupting enemy radar, communications, and computer networks with jamming signals and computer viruses. The aircraft also can destroy enemy radar installations with its AGM-88 High-speed Anti-Radiation Missiles (HARM).



The NGJ midband is an advanced electronic attack system that denies, disrupts, and degrades enemy communications and air-defense radar systems.

Raytheon's NGJ will integrate the most advanced electronic attack technology into the EA-18G, such as high-powered, agile beam-jamming techniques, and solid-state electronics to deny, degrade and disrupt enemy threats while protecting U.S. and coalition forces.

Raytheon's NGJ will provide airborne electronic attack and jamming capabilities, and will include cyber-attack capabilities that use the aircraft's active electronically scanned array (AESA) radar to insert tailored data streams into enemy radar and communications systems.

The NGJ also will have an open-systems architecture for future upgrades. Raytheon will use its gallium nitride (GaN)-based AESA technologies for the NGJ design.

Eventually Raytheon engineers may modify the NGJ to install it aboard the F-35 joint strike fighter, unmanned aerial vehicles (UAVs), as well as to other manned aircraft in addition to the EA-18G.

The goal of the NGJ technology-development phase is to develop an electronic attack system that will improve airborne electronic attack capabilities against advanced threats through enhanced agility and precision within jamming assignments, increased interoperability, and expanded broadband capability

for greater threat coverage against a wide variety of radio frequency emitters, Navy officials say.

The Navy also is developing the Next Generation Jammer Low Band (NGJ-LB) in an urgent effort to develop low-band tactical radar jammers using existing technologies for low size, weight, and power consumption (SWaP) applications on the EA-18G Growler EW jet.

L3Harris Technologies in Melbourne, Fla., won a contract in late 2020 to design and build the NGJ-LB, which experts say will be useful in jamming low-band radar systems design to detect stealth aircraft like the F-35 joint strike fighter. The NGJ-LB transmitter will fit in a pod on Station 6 of the EA-18G.

The system will enhance the performance of frequency coverage, effective isotropic radiated power, spatial coverage, spectral purity, and polarization; obtain existing contractor data related to transmitter group performance; and assess the potential to deploy an open-systems interim pod solution rapidly. ◀

On this contract Raytheon will do the work in Forest, Miss.; McKinney, Texas; and El Segundo, Calif., and should be finished by September 2024. For more information contact Raytheon Intelligence and Space online at www.rtx.com, or Naval Air Systems Command at www.navair.navy.mil.

IMAGINE THE FRONTIERS OF TOMORROW





**AIRCRAFTS, HELICOPTERS
& DRONES**



DEFENSE



**AVIONICS, DISPLAYS
& LIGHTING**



SPACESHIPS & SATELLITES



NEW FRONTIERS

- Adhesives, sealants & foams
- Optically clear materials
- Thermal interface & electrically conductive materials



**ELLSWORTH
ADHESIVES**

*Your total solutions provider in specialty
chemicals & application equipment.*

800.888.0698 | ellsworth.com

NASA looks to commercial companies for International Space Station astronaut missions

The National Aeronautics and Space Administration (NASA) is looking for private astronauts for commercial manned space missions. In that aim, NASA plans to enable missions to the International Space Station (ISS) for commercial enterprises. NASA has outlined a broad strategy to facilitate the commercialization of LEO by U.S. companies (see NID 8600.121: "Use of International Space Station for Commercial and Marketing Activities"). These private missions must use U.S. transportation vehicles that meet NASA's ISS visiting vehicle requirements, policies, and procedures. NASA is soliciting proposals for two independent flight opportunities with launch dates between November 2022 through the end of December 2023 for Phase II of Focus Area 4A. The maximum number of private astronauts per mission shall not exceed four, and the maximum planned docked duration shall not exceed 14 days. Proposals should be structured as detailed and should be limited to no more than 30 pages, not including any attachments. Only attachments that are specifically requested should be included, and page limits for those attachments are provided in section vii. Any pages submitted beyond the specified page count will be returned to the provider and will not be evaluated. For specific instructions on proposal formatting not covered in these instructions refer to section 2.6. Standard Proposal Style Formats of the NASA Guidebook for Proposers. Proposals and attachments must be submitted in .pdf format. Please see ISS NRA via NSPIRES at the following link. For more information, please contact Kelly L. Rubio at kelly.l.rubio@nasa.gov.

World's fastest airliner Overture to usher in new era of supersonic travel

The world hasn't seen commercial supersonic travel in nearly 20 years since the Concorde was retired in 2003, but all that is about to change with the development of a new, environmentally friendly airliner. Overture will fly Mach 1.7 over water with a range of 4,250 nautical miles. The Overture reveal at the Farnborough International Airshow is the culmination of 26 million core-hours of simulated software designs, five wind tunnel tests, and the evaluation of 51 full design iterations, resulting in an economically and environmentally sustainable supersonic airliner. On take-off, Overture will use the world's first automated noise reduction system. The airliner will fly without afterburners, meeting the same strict regulatory noise levels as the latest subsonic airplanes. These noise reduction efforts will deliver a quieter experience both for passengers and airport communities. Beyond the commercial applications of the supersonic

flyer, Boom and Northrop Grumman announced a partnership to develop special variants for U.S. and allied governments.

NanoAvionics extends its satellite bus range enabling advanced space missions

NanoAvionics in Logan, Utah is introducing two microsatellite buses, the MP42H and the MP42D, that can host space payloads as heavy as 145 kilograms and a total satellite mass as large as 220 kilograms. The satellites across the new bus range will enable more sophisticated missions in the fields of remote sensing, high data throughput and complex communications missions, emergency communications, fundamental research and as orbital transfer vehicles (OTV). All MP42 microsats are equipped with NanoAvionics's next-generation payload controller. The controller allows customers to build their own software blocks, similar to app developers creating apps. The microsats also provide intersatellite link for both LEO-LEO and LEO-GEO, which ensures uninterrupted real time communications. For communications missions, all MP42 buses provide customers with various options to tailor the satellites for their bandwidth and constellation coverage needs. The use for advanced missions and applications is a result of their modular design and being optimized to offer flexible envelopes to host customer payloads of up to 145 kilograms and a total satellite mass of up to 220 kilograms. Their design significantly reduces mechanical constraints for payload integration. This gives customers the ability to choose the shape and volume of their payloads, without interfering with the satellite frame. It also lowers their cost for development and payload integration and improves lead times and reliability.

Boeing to provide data link for remote-control of land-attack missile

U.S. Navy smart munitions experts are asking the Boeing Co. to provide

secure airborne data links to help guide Stand-off Land Attack Missile-Expanded Response (SLAM-ER) to their targets under terms of a \$9.2 million order. Officials of the Naval Air Systems Command at Patuxent River Naval Air Station, Md., are asking the Boeing Defense, Space & Security segment in St. Louis to provide 36 SLAM-ER AN/AWW-13 advanced data link pods for the government of Saudi Arabia. The pilots of launch aircraft can guide SLAM-ER missiles to their targets via this secure

ELMA
Your Solution Partner

Award-Winning Development Solutions



Elma's new CompacFrames are innovative lightweight platforms for card or system development based on open standards like VPX or aligned to SOSA™.

With you at every stage!

[Learn More](#)

Elma Electronic Inc.

elma.com



Powell®

From
PROTOTYPE To
PRODUCTION
Powell Has The
SOLUTION



Top Connector Brands

Assembly & Supply Chain Options

Large Inventory with Same Day Shipping

1-800-235-7880
connectorhelp@powell.com
www.powell.com

NEWS

tactical data link. SLAM-ER can launch from the Navy F/A-18 Super Hornet and the U.S. Air Force's F-15E Strike Eagle. The AGM-84H/K SLAM-ER is a standoff precision-guided, air-launched cruise missile from Boeing for the U.S. armed forces and their allies. The missile can attack moving and stationary land and sea targets from as far away as 155 nautical miles. The can be go into remote-control mode while in flight via the AN/AWW-13 data link, and can re-direct to alternative targets after launch if the original targets are destroyed or no longer a threat. The SLAM-ER missile is 14.3 feet long, 13 inches in diameter, and weighs 1,487 pounds. It is a derivative of the Boeing Harpoon anti-ship missile, which can attack land and sea targets. It relies on the Global Positioning System (GPS) and infrared imaging for its navigation and control. For more information contact Boeing Defense, Space & Security online at www.boeing.com/company/about-bds, or Naval Air Systems Command at www.navair.navy.mil.

Five Stones Research to pursue weapons, computer, and network cyber security

U.S. missile-defense experts needed cyber security to help safeguard weapons and networks in U.S. defenses against enemy ballistic missiles. They found their solution from Five Stones Research Corp. (5SRC) in Huntsville, Ala. Officials of the U.S. Missile Defense Agency (MDA) in Huntsville, Ala., announced a \$266.4 million contract to Five Stones Research to provide a variety of cyber security measures to help safeguard U.S. missiles defenses against enemy cyber attack. Five Stones Research will provide improved weapons systems cyber security; improved computer network cyber security; improved cyber systems integration; and documentation to ensure compliance

with all military cyber security policy, directives, and mandates; provide secure cloud-based information systems; evaluate proposed information technology IT solutions; and identify vulnerabilities and threat mitigations on military information systems for missile defense. Cyber security involves defending computers, servers, mobile devices, electronic systems, networks, and data from malicious attacks from computer hackers. It also is known as information technology security or electronic information security. Missile defense systems are among the most mission-critical integrated weapons, computers, and networking because compromised communications security could reduce the effectiveness of the nation's defenses. On this contract Five Stones Research will do the work in Fort Belvoir and Dahlgren, Va.; Huntsville, Ala.; Schriever Air Force Base, Colo.; and Fort Greely, Alaska, and should be finished by October 2027. For more information contact Five Stones Research Corp. online at www.5sr-hsv.com, or the Missile Defense Agency at www.mda.mil.

United Airlines inks purchase agreement with eVTOL company Eve Air Mobility

United Airlines in Chicago has announced a \$15 million investment in Brazil-based Eve Air Mobility. In addition, United has also signed a conditional purchase agreement for 200 four-seat electric aircraft plus 200 options, expecting the first deliveries as early as 2026. This continues United's investment in the Urban Air Mobility (UAM) market, also called "flying taxis" – or eVTOLs (electric vertical take-off and landing vehicle). Under the terms of the agreement, the companies intend to work on future projects, including studies on the development, use and application of Eve's aircraft and the

UAM ecosystem. Rather than relying on traditional combustion engines, eVTOL aircraft are designed to use electric motors, providing carbon-free flights and to be used as 'air taxis' in urban markets. Eve's design uses conventional fixed wings, rotors and pushers, giving it a practical and intuitive lift-plus-cruise design, which favors safety, efficiency, reliability and certifiability. With a range of 60 miles (100 km), its vehicle has the potential not only to offer a sustainable commute but also to reduce noise levels by 90 percent compared to current conventional aircraft. Eve is also creating a new air traffic management solution designed for the UAM industry to scale safely. This software is intended to perform at the same safety level as Embraer's existing air traffic management software and expected to be a strategic asset to helping the entire industry grow.

NASA's X-59 aims to open the skies for new supersonic airliners

The experimental airplane capable of reaching 990 mph will make its first flight later this year. For almost three decades, the slice of humanity who could afford it had access to supersonic

air travel. The Concorde regularly traversed the North Atlantic in three and a half hours on routes operated by British Airways and Air France. However, supersonic passenger flights never went further west in the United States than international flights on the East Coast. Government restrictions prevented ear drums and windows from being shattered by sonic booms from sea to shining sea. The X-59 is shaped to reduce the loudness of a sonic boom reaching the ground to that of a gentle thump, if it is heard at all. It will be flown above select U.S. communities to generate data from sensors and people on the ground in order to gauge public perception. That data will help regulators establish new rules to enable commercial supersonic air travel over land. NASA is working closely with Lockheed Martin to create a large database of computational fluid dynamics simulations to verify the aircraft's supersonic performance. The database includes simulations for all possible combinations of settings that a pilot uses to control the aircraft and the flight conditions that may be encountered. This database is crucial for supplying data for a flight-planning tool that is being used to assist and teach pilots how to fly the X-59, before it even flies. ◀

Functionally Sized and I/O Optimized

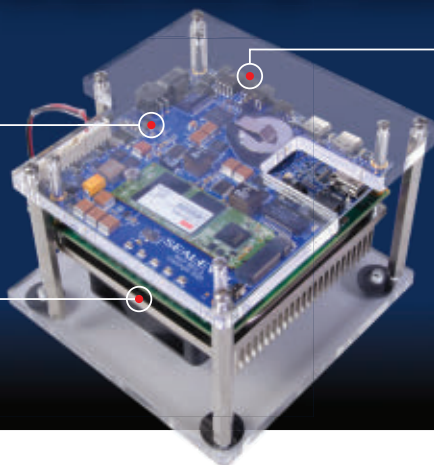
12009 COM Express Compact Type 6 Evaluation Board

ROBUST PROCESSING

- Designed for the congatec® conga-TC370 COM Express Family
- Support for 8th generation Intel® Core™ Processors

SMALLEST-IN-INDUSTRY COMPACT TYPE 6 FOOTPRINT

- 95mm x 95mm
- Identical in size to a Compact Type 6 COM Express Module



DIVERSE I/O MIX

- Gigabit Ethernet, USB 2.0/3.0
- Mini DisplayPort
- M.2 SATA SSD
- RS-232, UART, GPIO



Sealevel Systems, Inc. is the leader in COTS, full custom, and OEM hardware and software for critical communications. Wide-ranging industries and every major military contractor recognize Sealevel for our unmatched engineering expertise, world-class manufacturing, and customer satisfaction commitment.

Whether you want to leverage existing technology or create something entirely new—we'd love to set new standards. Together.

SEALEVEL®
sealevel.com

Reliability, Availability, and Support Beyond the Life of Your Mission

Counter-UAS technologies

MILITARY



Enabling technologies for counter-UAS technologies help safeguard sensitive perimeter security tasks for airports, military bases, nuclear power plants, and more.

BY Megan Crouse

Technology to counter unmanned aircraft continues to develop. 2022 has seen two major areas of change: practical, battlefield use in Ukraine, and a U.S. Federal Aviation Administration (FAA) effort to test counter-unmanned-aircraft systems in commercial airports.

Military and commercial counter-unmanned-aerial-systems (UAS) are seeing wide deployment and experimentation. On the military side, adversaries may launch drones for reconnaissance or arm them. In the commercial world, drones can be for photography to monitor large farms, or to deliver goods.

They also may have uses in an otherwise commercial setting, such as drug trafficking or smuggling. Ever since small drones became feasible to use, the question has been raised of how to deter them from, intentionally or by accident, causing damage to infrastructure and other vehicles sharing their air space.

A counter-UAS system needs to function in three stages: detection, tracking and jamming,

and capture or destruction. Each C-UAS system may feature one or more of these stages. Perimeter security for airports may see heavy air traffic and include a wide array of infrastructure and facilities.

The U.S. Department of Defense (DOD) has considered unmanned systems to be a threat sufficient to deploy technologies against them since at least 2014. The U.S. Government Accountability Office (GAO) notes that, although the counter-UAS field has matured since then, it still specializes

in a relatively narrow window of drones against which it can defend. Small UAS that weight less than 55 pounds are more likely to get through a defensive screen; few technologies today can successfully jam the radio frequency (RF) control signals of a drone. While the effectiveness of modern jamming also ends at around 1,000 feet away at most many companies today are working on pushing the envelope.

▲ The Joint Counter-sUAS Office (JCO) and the Army Rapid Capabilities and Critical Technologies Office (RCCTO) help counter-UAS experts from the U.S. military services and federal agencies hone their skills at Yuma Proving Ground, Ariz.

take on latest THREATS

Lessons learned the Ukraine war

The war in Ukraine has provided a real-world testing ground for UAS and counter-UAS systems. The inclusion of the VAMPIRE Counter-Unmanned Aerial System from L3Harris Technologies Corp. in a nearly \$3 billion military assistance package from the U.S. made headlines in August. Although initially reported to be a counter-drone system, in fact, it's a small missile that not only can launch against drones, but also against ground installations and low-flying piloted aircraft. That said, the Russian military is known to use drones in Ukraine for artillery spotting, general surveillance, and as improvised munitions.

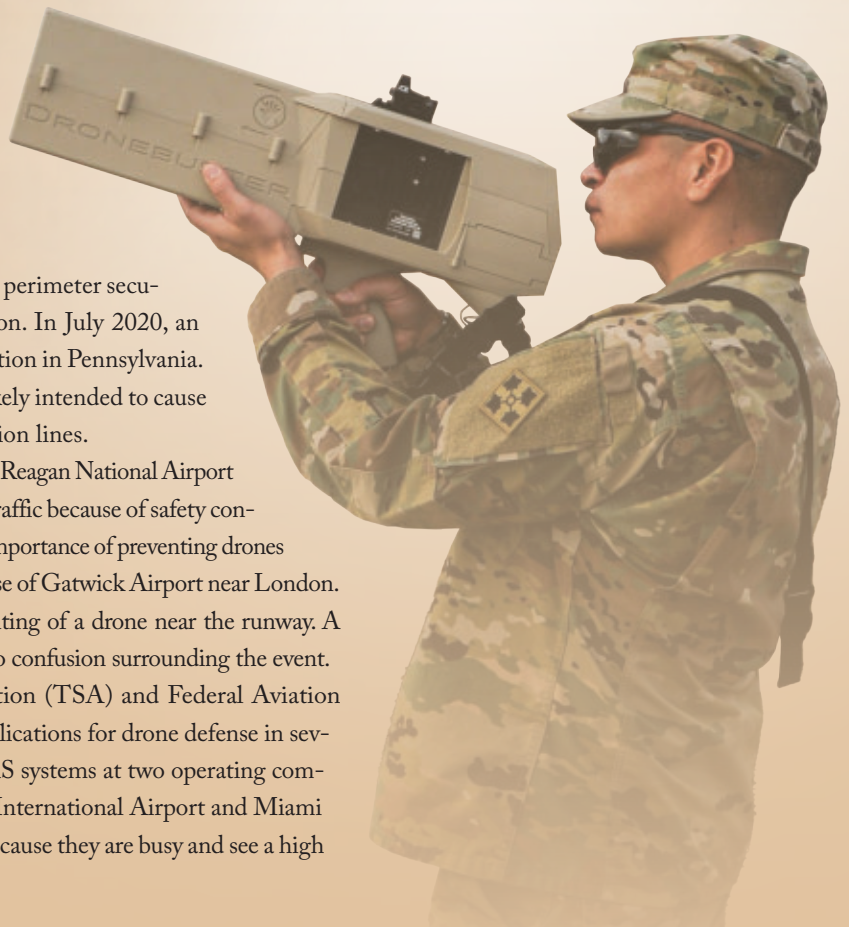
Russia's strategy of deploy a network of meshed low-cost sensors of different types to provide early identification of targets has shown mixed effectiveness against Ukraine's small, mobile drones, experts say.

Energy infrastructure also may be a place where perimeter security designers should take drones into consideration. In July 2020, an unknown operator flew a drone near a power substation in Pennsylvania. Federal law enforcement indicated the drone was likely intended to cause a short circuit to damage transformers or distribution lines.

In June 2022, a drone flying too close to a runway at Reagan National Airport in Washington caused a 45-minute shutdown of air traffic because of safety concerns. Perhaps the most famous instance showing the importance of preventing drones from interfering with commercial airspace was the case of Gatwick Airport near London. In 2018, thousands of flights were affected by a sighting of a drone near the runway. A lack of effective detection and tracking contributed to confusion surrounding the event.

The U.S. Transportation Security Administration (TSA) and Federal Aviation Administration are working on testing practical applications for drone defense in several commercial airports. The TSA is testing C-UAS systems at two operating commercial airports as of August 2022, at Los Angeles International Airport and Miami International Airport. These airports were chosen because they are busy and see a high frequency of UAS activity already.

▼ U.S. Army Yuma Proving Ground has years of experience testing counter-UAS equipment, and is home to a counter-UAS school that gets students from all branches of the military, as well as civilian law enforcement agencies. Army photo





The U.S. Department of Defense carries out counter-UAS mission planning with the Joint Counter-sUAS Office (JCO) and the Army Rapid Capabilities and Critical Technologies Office (RCCTO).

“While there are many beneficial uses for drones in our society, it is becoming far too common that drones are sighted near airports, which presents significant security risks and unnecessary disruptions to the traveling public,” says U.S. Rep. Lucille Roybal-Allard, D-Calif.

This is in addition to five other commercial airports chosen in March 2021 as hosts for the Airport Unmanned Aircraft Systems Detection and Mitigation Research Program, which

will serve as a test bed for UAS detection and mitigation technologies for the FAA through 2023. The projects includes at least ten technologies or systems drawn from manufacturers, vendors, and integrators in 2020.

Another challenge to keep in mind in regards to C-UAS in perimeter security is the density of radio signals. C-UAS systems studied in 2017 did not have sufficient frequency accuracy, a 2022 Office of Inspector General report noted. This influenced

AirBorn

Introducing SInERGY®

- Speeds up to 25Gbps
- 4 points-of-contact
- High-density, configurable in 1-5 bays
- Interchangeable molded signal & SMPM RF insulator bays



- Tested & qualified based on MIL-DTL-83513 performance requirements
- Discrete wire, SMPM RF, & Twinax cable variations

a i r b o r n . c o m

5G

Outdoor Omnidirectional Antennas for 5G Networks

Our new selection of 5G, Outdoor-Rated Omni Antennas are designed for high reliability in extreme weather conditions and cover 4G, LTE, 5G, and CBRS bands.

These collinear omnidirectional antennas offer range extension and simple deployment to build out cellular communications networks as well as private networks. When you need broad coverage, but traditional base station antennas are too bulky or expensive, these 5G omni antennas are a perfect fit.

Place your order by 6 PM CT, and have your antennas or any other components shipped today.

pasternack.com
+1 (866) 727-8376
+1 (949) 261-1920

In-Stock and Shipped Same-Day



what the FAA would communicate to vendors over the next few years, seeking better RF accuracy and cutting out the need for human operators to weed out false positives. Its guidance lead directly to the 2021 research program.

To some extent, the FAA is expecting delays on the program. They expect to be able to assess safety risks and benefits by 2024 at earliest, with leeway for the nation's supply chain issues and other COVID-19 related barriers.

The TSA's detect, track and identify (DTI) system at Los Angeles Airport demonstrates the capabilities such a system typically has. It operates 24/7 using RF waves, electro-optical, radar, acoustic, and thermal imaging. Using the Android Tactical Assault Kit platform, airport police can view a drone which approaches or passes the airport perimeter and tell its elevation, direction and type.

The FAA predicts that airports must contend with only more drones in the future. The commercial UAS fleet will reach around 828,000 by 2024, FAA experts predict, with another 1.48 million drones in the sky for recreational use. The commercial UAS traffic management market will be worth \$1.9 million over the next five years, of which \$720 million

will come from government investment in research and early deployment, surveys show.

Several factors have slowed deployment of drone traffic management technologies, experts say, including budgetary constraints following the Covid pandemic, a lack of clarity in proposed regulations, and continuing confusion around the business case for UAS traffic management technology suppliers and service providers.

One company working on perimeter security for airports is DroneShield, of Warrenton, Va. The company's DroneSentry for civilian airports features passive long-range drone detection sensors and proprietary command-and-control software to detect drones in real time.

DroneShield also has a product notable for its small size: the military-grade DroneGun MkIII. Recently picked up by an undisclosed U.S. government agency, this is a pistol-sized passive UAS detection device which works by jamming drone RF control signals.

Other companies such as Flex Force Enterprises in Portland, Ore., also have been brought in by the Pentagon as approved distributors of handheld counter-UAS. Their Dronebuster, an RF jammer, can break the connection between a drone and its

operator, and force it to return to base. The system also can overwhelm a drone's satellite navigation signals to drive it home or render it inert.

SOSA Aligned OpenVPX Chassis With Advanced Cooling



- Designed specifically for high-wattage applications
- Various SOSA aligned profile options
- Speeds to PCIe Gen4 and 100GbE
- Modular MIL Rugged design for versatility
- SlotSaver SOSA aligned chassis manager mezzanine



www.pixustechnologies.com

Detection, interception, and neutralization

Enabling technologies for counter-UAS systems must combine detection, interception, capture, or destruction. Most C-UAS technologies use RF and radar systems to detect UAS activity in the surrounding area. Long-range radar can scan an area three or four times each second. According to the GAO's 2022 tech spotlight, other common methods include infrared devices, RF systems, and acoustic sensors. Respectively, these scan for heat signatures, RF control signals, and the sound of a motor. UAS detection and tracking from the ground often uses the same types of solutions used on the drones themselves, which typically are sound and radio, but can be much larger.

ASIS International, a security firm in Alexandria, Va., points out that the leading

C-UAS approach is to layer multiple sensors. RF sensors might be combined with 360-degree, long-range radar. A benefit of these radars is their ability to detect small intruders like mylar balloons or parachutes.

From there, mitigation aims to prevent the drone from completing its mission or continuing through the airspace. According to a 2019 report cited by the GAO, jamming with interference signals is the most common method of mitigation. The people defending the airport or base perimeter also may use physical methods to bring the drone down, such as nets, lasers, or projectile weapons. The latter is particularly dangerous, though, because the drone or the shot itself may damage the very infrastructure one is trying to protect.

Last year, Aurora Flight Sciences, a Boeing UAS company in Manassas, Va., demonstrated a kinetic solution that fires copper discs attached to an air gun with string, intended to tangle in rotor blades.

Teledyne FLIR in Wilsonville, Ore., and InVeo Designs LLC in Louisville, Ky. benchmark potential C-UAS cameras with a new product, the Neutrino SX12 ISR1200 high-performance medium-wave infrared (MWIR). Capable of integrating with perimeter surveillance software, it features the Teledyne FLIR MWIR camera module and imaging electronics focusing on intelligence, surveillance, and reconnaissance (ISR) applications with low-switching-cost. Dual-parallel outputs use a 60 Hz Camera Link base with 1080P30 HD-SDI or 720P60 HD-SDI for tracking, turbulence mitigation, and artificial intelligence (AI).

Interception

After the detection stage, it's time to get the unwanted drone out of the protected airspace or stop it from operating. Using video analytics and RF and radar signatures, security teams will determine how much of a threat the drone poses. The FAA notes that this is a matter of case-specific expertise and situational awareness, as "There are no nationally recognized standards for detection or classifying UAS at this time," as stated in March 2022.

From there, the security team responsible for the perimeter can use either electronic means like jamming or spoofing, or kinetic mean to bring down the UAS. Today, non-kinetic techniques are more common. Some drones used in military capacities can take control of adversary UAS and safely maneuver them outside of the perimeter, and away from sites where they could damage.

Defending military base perimeters

GAO notes that the FAA has explored long-range jamming technologies for domestic military bases in rural locations, where there are few cities or commercial airports. In these



FPGAs Your Way

Acromag's high-performance XMC, PMC and mPCIe-based FPGA modules feature a user-customizable Xilinx® FPGA. These modules allow you to develop and store your own instruction sets in the FPGA for a variety of adaptive computing applications.

Select from several models with up to 410K logic cells optimized for logic, DSP, or PowerPC. The high-speed memory and fast bus interfaces rapidly move data.

Choose Your Performance Level

NEW! ▶ Zync® UltraScale+™ MPSoC FPGA module
Artix®-7 FPGA module
Kintex®-7 FPGA module
Spartan®-6 FPGA module

High-Speed Sampling and Stimulus

- Fast response I/O processing loops run at FPGA speeds
- Simultaneous parallel logic rather than sequential code
- FPGAs for real-time data acquisition and processing
- FPGAs provide deterministic I/O

Flexible I/O Front Interface

AXM Series extension modules offer numerous I/O options for Acromag's PMC and XMC modules with configurable FPGA. These extension modules plug into the front mezzanine on Acromag's FPGAs.

- ▶ A/D, D/A | Digital I/O | Serial communication



Because We Know I/O

Doing business with Acromag means you can count on our 60+ years of industry knowledge when choosing your supplier. A global network of sales professionals gives you local access to friendly, highly trained support specialists. At the US factory, we guarantee support with a real person within one business day.





Together with the Air Force, the Joint Counter-sUAS Office (JCO) and the Army Rapid Capabilities and Critical Technologies Office (RCCTO) hosted a demonstration in counter drone technology at Yuma Proving Ground, Ariz., last April. Army photo

places, jamming typically does not risk disrupting legitimate or mission-vital signals. Counter-drone systems also need to know what else may be in the sky, from power lines to birds.

One relatively long-term plan for a solution comes from the Modular Efficient Laser Technology (MELT) program of the U.S. Defense Advanced Research Projects Agency (DARPA) in Arlington, Va. DARPA's MELT program seeks to direct high-energy lasers against adversary drones.

In January 2022 DARPA put out a broad agency announcement seeking a compact, scalable, actively coherently beam combined semiconductor laser source for a small, affordable laser source. Laser weapons are desirable because of their effectively unlimited ammunition magazine. Yet to put it simply, DARPA is exploring coherent beam combined tiled arrays because they enable relatively small systems. The MELT program will run for five years.

Another counter-UAS challenge DARPA is seeking to solve is enabling laser weapons to function across a broad range of power levels, from a few kilowatts to megawatts, since drones can range in size so much.

Jamming or spoofing?

At the neutralization stage, there is a key difference between jamming and spoofing. The former blocks RF and GPS communications between the drone, its operator, and its navigation system. It destroys the drone's ability to communicate. With the latter, defenders can deceive GPS signals to the UAS's receiver to take control of the drone. It sends a false signal that can take advantage of the drone's ability to communicate.

Counter-jamming also is used in the chess game of attacking and defending drones. If an adversary denies a drone's satellite navigation as in a jamming event, the drone may switch to an autopilot with GNSS-denied capability. This introduces some navigation errors, but ideally will allow the operator to maintain stability and control and eventually recover the friendly drone.

Neutralization

The Thales Group in Paris has demonstrated drone neutralization with the company's Horus-Shield anti-drone system at sporting events and around the perimeter of critical infrastructure. Also using components proven in border surveillance, it is an example of how to detect and jam neutralize drones, in this case using RF jamming.

Thales also recently announced a partnership with MARSS Group in Monaco to integrate the NiDAR C2 security platform with the drone-neutralization systems. Details on the inside of these boxes is scarce, but the partnership does show a United Kingdom initiative to keep the industry growing through the integration of counter-UAS with other security software designed to defend against homeland threats and improve situational awareness.

Companies in industry like BlueHalo in Arlington, Va., which recently acquired Citadel Defense Co in National City, Calif., continue to invest in artificial intelligence and machine learning. Citadel uses AI and machine learning at every stage of drone detection and defense in their work with the U.S. Department of Defense. Citadel's Titan line of products can track patterns of UAS activity, including geolocating drone and pilot. It follows the trend of integrating multiple sensors, using radar and optics as well as AI analytics.

BlueHalo also emphasizes the speed of deployment for this product, saying the Titan system can be deployed in under two

WHO'S WHO IN COUNTER-UAS TECHNOLOGY

ASIS Technology

Alexandria, Va.
<https://www.asisonline.org>

Aurora Flight Sciences

Manassas, Va.
<https://www.aurora.aero>

BlueHalo

Arlington, Va.
<https://bluehalo.com>

DroneShield

Warrenton, Va.
<https://www.droneshield.com>

ELTA North America

Annapolis Junction, Md.
<https://eltanorthamerica.com>

Flex Force Enterprises

Portland, Ore.
<https://flexforce.us>

InVeo Designs LLC

Louisville, Ken.
<https://www.inveodesigns.com>

L3Harris Technologies Inc.

Melbourne, Fla.
<https://www.l3harris.com>

Lockheed Martin Corp.

Bethesda, Md.
<https://www.lockheedmartin.com>

MARSS Ltd.

London
<https://www.marss.com>

Teledyne FLIR LLC

Wilsonville, Ore.
<https://www.flir.com>

Thales Group

Paris
<https://www.thalesgroup.com/en>

minutes and requires a minimum of training for operators to get up to speed. It also responds to another trend we talked about last year: swarms. A Program of Record (POR) selection awarded to BlueHalo by the DoD in August includes an automated decision engine that cues up electric countermeasures, taking the human element out of discriminating frequency-hopping spread spectrum signal characteristics.

Swarms and layered sensors

Lockheed Martin Corp. in Bethesda, Md., advertises the company's laser weapon system as a possible counter for drone swarms. ELTA North America and Aurora Flight Sciences both emphasized the importance of autonomy in the system they deployed at an Army Rapid Capabilities and Critical Technologies Office demonstration in April 2021.

"We all know warfighters are wearing multiple hats as it is, so having something connected to the network that is fully autonomous is crucial," says Dean Nohe, senior director of business development for ELTA North America, in a statement to the Army. "[Their product] takes the network or sensor feed and assigns the right drone to the right threat. Once it gets close to the target, there's on-board processing

and on-board AI that enables an optical target lock and continues the autonomous guidance to the drone until interception."

A 2021 report from the NATO-affiliated Joint Air Power Competence Centre notes even as autonomy improves, another important consideration is to keep a human in the loop. Human operators provide moral, ethical and legal considerations on top of an automated system.

A layered approach also is being adopted, related to the idea of sensor fusion. ASIS points out that radar and RF devices can be paired with multi-sensor EO/IR cameras with light and thermal sensors. Furthermore, the field approaches the era of AI with Convolutional Neural Network analytics, which can be trained to detect and discriminate between objects based on pixel-sized differences. Tracking software in this area needs to respond very quickly, leading to the development of specialty software for quick classification and auto-tracking.

The GAO notes that as drones become smaller and more maneuverable, counter-UAS technology will need to keep up. Counter-UAS technology could prove critical at airports, military bases, sports events, sensitive national security facilities and more. ◀

PICO



Transformers & Inductors

SURFACE MOUNT (and thru-hole)

AS9100D
CERTIFIED


Size Does matter!

Low Profile
From .18" Height
1.2 Grams Weight

Reliability:
MIL-PRF-27/MIL-PRF-21038
Manufacturing Approved DSCC

Quality:
AS9100D Qualified Facility

US Manufactured
 Military and Commercial Aircraft
 Supplier for over 50 Years

**For all your
 TRANSFORMER
 & INDUCTOR
 requirements**

- Audio • Pulse
- DC-DC • MultiPlex
- Power & EMI

See Pico's full Catalog immediately on
 our new website
www.picoelectronics.com

800 431-1064

Fax 914-738-8225
 E Mail: info@picoelectronics.com

PICO

Electronics, Inc.
 143 Sparks Ave. Pelham, N.Y. 10803-1837





Delivery - Stock to one week



ARTIST RENDERING

Thermal-management techniques take-on the heat

Hot components like processors and power-management devices require advanced electronics-cooling designs to help today's aerospace and defense electronics keep performance at its peak.

BY John Keller

One stubborn constant of nearly every electronics design is the byproduct of heat. It's nearly impossible to use power efficiently enough to eliminate waste heat altogether. Enhancing efficiency can help reduce waste heat — but only to a degree.

Today's new generations of powerful general-purpose processors, general-purpose graphics processing units (GPGPUs), field-programmable gate arrays (FPGAs), and other components notorious for heat generation make the challenge of removing excess heat from electronics more dire and urgent with each passing year.

Advanced systems like the hypersonic weapons depicted above are running hotter than ever, which increases pressure on designers to find efficient thermal management techniques.

Raytheon photo

Neglecting heat removal in electronics can have consequences ranging from reduced processor performance to outright system failure if internal components start to burn or melt. In fact, we've seen predictions that electronics cooling and thermal management challenges have the potential

to bring Moore's Law to a screeching halt. Moore's law is the observation that the number of transistors in a dense integrated circuit doubles about every two years.

As a result, systems designers have devised several new proprietary and industry-standard approaches for dealing with growing levels of electronics heat.



RF Custom Cable Assemblies

Fairview Microwave stocks and builds the industry's most comprehensive selection of custom RF cable assemblies. With over 250,000 possible combinations all available to ship the same day, Fairview Microwave RF custom cable assemblies in coaxial and twinaxial are the solution for your urgent needs. Whether you're looking for a common cable or something unique to your specifications, Fairview Microwave allows you to design your own custom RF cable assembly.

RF custom coaxial cable assemblies can be built from over 1,300 connector types and close to 125 different coax cables (including Twinax). Fairview Microwave can also provide you value-added services for your custom RF cable assemblies such as a suite of testing solutions, custom labeling, lead-free solder, custom booting/heat shrink options, plus more. If you're interested in designing your very own custom coaxial cable assemblies, please use our Cable Creator™ today!

Place your order by 6 PM CT, and have your cables or any other components shipped today.

In Stock & Shipped Same-Day

fairviewmicrowave.com
+1 (800) 715-4396

 **Fairview Microwave®**
an INFINITE brand



Knowing the environment

"The environment is the most important part of thermal management, and we have to design to what we can handle in the environment," explains David Jedynak, general manager of the Parvus business unit of the Curtiss-Wright Corp. Defense Solutions segment in Ashburn, Va. "We will not make product that uses processors that are wildly outside the current envelopes that we deal with. We need to make sure we stay within the envelope

so we actually can cool, and get the same performance out of that power envelope."

Testing and computer modeling of expected operating environments are key parts of anticipating electronics cooling requirements, points out Jens Weyant, vice president of product development at Advanced Cooling Technologies (ACT) in Lancaster, Pa. Sometimes, he says, the thermal models just aren't right.

Many embedded computing designers rely on

thermal-management standards set down by the VITA Open Standards, Open Markets industry trade association in Oklahoma City. Among these are VITA 48.1, 48.5, and 48.8 for air cooling, VITA 48.2 for conduction cooling, and VITA 48.4 for liquid cooling. These standards, and others, Weyant contends, suggest test and modeling environments that might not provide an accurate picture.

"The VITA specs suggests applying a constant temperature model," Weyant says. "That is fine for lower-heat-flux applications and uniform heat loads in a uniform heat sink, but when the overall heat load is driven by a single component, you have a concentrated heat load. By modeling it that way, you could design yourself into a corner and give yourself problems at testing."

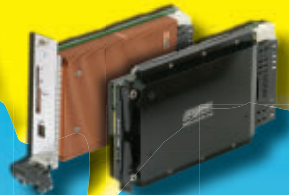
The problem is a constant temperature model does not account sufficiently for hot spots from high-performance processors or other hot components. "When you apply a constant temperature boundary condition, the model assumes the heat can be removed uniformly from that surface, but when you have a concentrated heat load, that thermal bottleneck is pretty important."

Perhaps a more accurate thermal modeling approach involves looking beyond individual embedded computing models to the whole picture of the computing enclosures. "You need to capture what the chassis is doing, if you can, with modeling some kind of resistance — even if it's just an estimate," Weyant says. "The second step is to get

Rugged, Reliable and Ready



Our designer friendly and flexible technology can solve many of your application problems in the design phase.



Dawn's advanced backplane topology customization tools now feature OpenVPX Fabric Mapping Modules.

Contact Dawn to ease the design-to-production transition and reduce deployment time to enable high performance, mission critical systems. We look forward to speaking with you soon.

*You need it right.
You want Dawn.*

Dawn
Dawn VME Products®

(510) 657-4444

dawnvme.com

WWW.MILITARYAEROSPACE.COM

Choose the **best thermoelectric enclosure cooler** on the market.

Choose TECA.

"TECA is hands-down the best supplier I have ever worked with."

"I am certainly pleased with your customer service and the performance of your product. In fact, I haven't had to think about them at all since they were installed!"

CUSTOMER TESTIMONIALS



Trusted by defense & aerospace for decades,
TECA's thermoelectric enclosure coolers offer

maximum cooling



maximum efficiency



maximum service life



teca[®] cools everything.

ThermoElectric
Cooling America
Corporation

773.342.4900
teca@thermoelectric.com



MADE IN
CHICAGO

DISCOVER THE TECA DIFFERENCE

www.thermoelectric.com/the-teca-difference/

an accurate representation of the wedge-lock clamp or card retainer, which is where most of the heat goes off the card. That resistance can be overly-simplified, which can mislead true performance.”

Systems designers should consider where in their systems are the most severe hot spots — typically where processors, GPGPUs, FPGAs, and other hot components are. “If a card has a very high point heat load, you need to get more ways to model that,” Weyant says. “It is a significant bottleneck.”

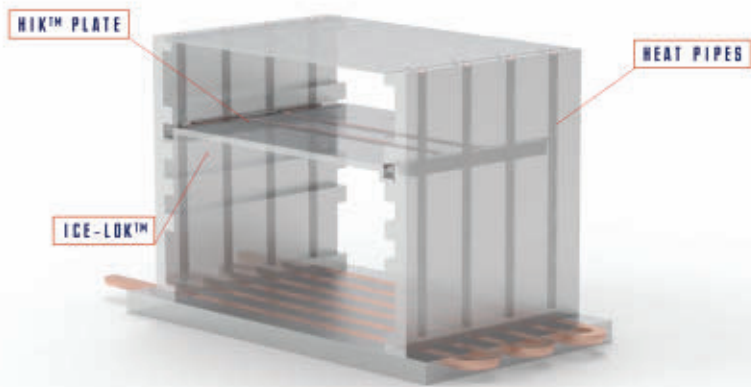
Electronic systems designers are concerned with size, weight, and power consumption (SWaP), how long they want their systems to last in severe conditions, and how much computing power they need to get the job done. “Our customers want something that will work in the environment; that’s what they start with,” says Curtiss-Wright’s Jedynak. “It comes down to an issue of performance, SWaP, and reliability.”

Piloted aircraft, for example, can have demanding requirements, yet also hold some advantages based on their operating environments. “If you are in a pod under a wing moving really fast, there is a lot of air there for free,” Jedynak continues. “If your fan goes down, there are so many other moving parts, that the minute anything goes wrong, you are landing anyway.”

Aircraft systems designers must deal with altitudes, air densities, and air temperatures, Jedynak points out. The trick is to balance different aspects flight, from the runway to maximum altitudes. “The air at altitude is quite cold to start with, but when the air pressure drops, there is less air density to carry away the heat. The real problems come when the platform is sitting on the runway on the hottest day of the year.”



Curtiss-Wright has developed Air Flow Through cooling technology to support the most demanding heat dissipation requirements.



Advanced Cooling Technologies (ACT) is developing electronics cooling designs at the circuit card level, as well as the chassis level.

Applications and thermal management

So why is there so much heat in today’s electronics? A big part of the answer involves advanced data processors, which include general-purpose processors like the latest-generation Intel Xeon and Core i7 general-purpose processors, GPGPUs like the NVIDIA HGX A100 and AMD EPYC, and FPGAs like the Xilinx Virtex-7 and Microchip PolarFire. Even though these processors operate with high efficiency, their huge performance makes them among the biggest heat producers in embedded computing designs.

It’s not just data processors that producing the heat. Radar transmit-receive modules, power control and conditioning circuitry, and infrared sensors can produce heat, or need cooling to function at their top performance.

Companies that use these kinds of components “are pushing the limits of that embedded computing system,” says ACT’s Weyant. “They must deal with hot chassis temperatures, very high power, and have low temperature rise to work with. They most likely are using advanced heat spreaders, and doing things on the chassis side to reduce temperature.”

Embedded computing specialist General Micro Systems Inc. (GMS) in Rancho Cucamonga, Calif., is providing high-performance rackmount computer servers for the U.S. Navy P-8A Poseidon maritime patrol and surveillance aircraft, which has heavy-duty sensor-processing demands for target detection and tracking, as well as for situational awareness.

For this application GMS uses the company’s Titan Intel scalable server processors. “These are very high-wattage processors, and although bigger than the processor inside your laptop, they have a very high heat density, or Watts per square inch,” explains GMS Chief Technology Officer Chris Ciufo. “When you have processors that dissipate a lot of power, like a scalable Intel Xeon, it can be up to 100 Watts.”

The GMS Titan computer servers aboard the P-8A aircraft are running the Navy's Minotaur computer software to fuse together aircraft sensors, ranging from dropped and towed sonobuoys, and the infrared sensors and visible-light cameras that are displayed on the P-8A's operator consoles. "Our Titan servers interface with a variety of the sensors, and Minotaur runs on these servers," Ciufu says.

Thermal management solutions

So, how to deal with these high levels of heat in modern electronics? ACT engineers, for example, have developed a special circuit card wedge lock called the Isothermal Card Edge (ICE)-Lok. "It looks like a typical card wedge lock, and expands in two directions, as opposed to typical wedge locks that expand in only one direction, says ACT's Weyant.

"We can contact more area on the card, and bypass metal-to-metal resistances in the clamp. It gives us lower thermal resistances and twice the contact area," Weyant says. It is proprietary, and we have some patents."

Standard wedge locks, he explains, have wedges at one angle that slide against each other. Instead, ACT's ICE-Lok, which is

made of aluminum with standard coatings, has a complex slide that expands in two directions. "It's not a big deviation from traditional wedge locks, and hopefully does not require a redesign in upgrades," Weyant says.

"We have done quite a bit of testing; we measure the surface where the heat enters the card. We are about 30 percent less heat across that joint, as opposed to standard off-the-shelf wedge locks. It is a nice addition to a heat pipe embedded card."

GMS takes inspiration from open-systems design guidelines like the VITA standards, but seeks to refine the company's design approaches to fit individual system requirements. "From a GMS standpoint, we watch the standards. At times we indicate where we are complying with VITA standards, but we have evolved those standards further into our systems when we think we have a better idea," Ciufu says. "We improve on them as we see fit."

The thermal-management baseline of the GMS Titan rugged computer servers aboard the Navy P-8A aircraft is VITA 48. "We applied what we learned there to our Titan 1U and 2U rack-mount servers, which are 100 percent conduction-cooled, but air is sucked through the servers from the front panel to the rear panel to cool the conduction cooled modules inside," Ciufu explains.



atrenne.com

- Enclosures
- Backplanes
- System integration
- Custom solutions
- CompactPCI
- VME
- VPX
- OpenVPX



Gen-4/5 Backplanes







Atrenne Computing Solutions | sales@atrenne-cs.com | (508) 588-6110

When failure is not an option...

... TRUSTED COMPUTING SOLUTIONS

WHO'S WHO IN EMBEDDED COMPUTING THERMAL MANAGEMENT

Abaco Systems

Huntsville, Ala.
<https://www.abaco.com>

Advanced Cooling Technologies Inc. (ACT)

Lancaster, Pa.
<https://www.1-act.com>

Advanced Thermal Solutions Inc.

Norwood, Mass.
<https://www.qats.com>

Aitech Defense Systems Inc.

Chatsworth, Calif.
<https://aitechsystems.com>

Atrenne Computing Solutions, a Celestica company

Brockton, Mass.
<https://www.atrenne.com>

Behlman Electronics Inc.

Hauppauge, N.Y.
<https://www.behlman.com>

Boyd Corp.

Lancaster, Pa.
<https://www.boydcorp.com/thermal/two-phase-cooling.html>

Crane Aerospace & Electronics

Lynnwood, Wash.
<http://www.craneeae.com>

Crystal Group Inc.

Hiawatha, Iowa
<https://www.crystalrugged.com>

Curtiss-Wright Defense Solutions

Ashburn, Va.
<https://www.curtisswrightds.com>

Data Device Corp.

Bohemia, N.Y.
<https://www.ddc-web.com>

Elma Electronic

Fremont, Calif.
<https://www.elma.com>

Extreme Engineering Solutions (X-ES) Inc.

Verona, Wis.
<https://www.xes-inc.com>

General Micro Systems Inc.

Rancho Cucamonga, Calif.
<https://www.gms4sbc.com>

Kontron America Inc.

San Diego, Calif.
<https://www.kontron.com>

Meggitt Defense Systems Inc.

Irvine, Calif.
<https://meggittdefense.com>

Mercury Systems Inc.

Andover, Mass.
<https://www.mrcy.com>

Milpower Source Inc.

Belmont, N.H.
<https://milpower.com>

Parker Hannifin Corp. Aerospace Group

Alexandria, Va.
<https://www.parker.com>

Vicor Corp.

Andover, Mass.
<https://www.vicorpower.com>

"We took our knowledge of conduction cooling, and have heat sinks and heat plates and other baffling on them, to where when air is sucked through these conduction-cooled servers, that air blows across conducted-cooled surfaces and effectively we have a conduction-cooled server, but that just happens to have air flowing through it. We were inspired by the VITA standards, but we do not claim compliance," Ciufo says.

GMS engineers also deviate from the VITA standards by using vapor-phase cooling inside the Titan servers. "We have big hunks of metal that look like top-side heat sinks," Ciufo says. "Inside are fluids that use vapor phase cooling — like how a heat pipe works, which moves heat from one part of the conduction cooled assembly to another part, and that heat is given up into the air flow. Our vapor-phase cooling is on custom-made metal structures, which is very effective at evening-out heat over a large structure. It moves heat from one area to another to dissipate more heat into the air flow."

Vapor cooling exists in a closed environment, in which fluid boils in hot areas, turns to vapor, and condenses. "We are taking that technology, and embedding it into our six- and eight-slot ATR chassis, which is available in 3U and 6U OpenVPX versions. Heat pipes move the heat from each card edge channel on the right and left sides of the cards, which give up their heat from the processor to the card edge, to the chassis sidewall, and that's where we will have heat pipes to move the heat to the back of the chassis where the fans are. The fans will cool a radiator device, and it continues in a closed-loop pattern."

This approach is an advanced cooling technique for hot-spot cooling that removes more heat than with passive chassis or air

flowing by in an open chassis," Ciufo continues. "We also have inlet air and outlet air on the back of the chassis for avionics bays and ground vehicles. Cool air in, and hot air out, is all done in the back of the chassis."

There's more in store for GMS embedded computing chassis in the future as company engineers make a switch from metal to carbon fiber for selected applications. "We are going to build these chassis out of carbon fiber, which has superior energy transfer," Ciufo says. "It is much more conductive than standard aluminum alloy, so we can dissipate more heat." Carbon fiber also is more lightweight than aluminum alloy by 10 to 15 percent, he says.

GMS designers also are expanding on their company's established RuggedCool thermal-management technology to move heat away from hot components like processors. "Rather than using a heat sink on top of the hot components, we use a structure that has metals, a spring, and viscous materials," Ciufo says. "It improves the heat transfer from the top or bottom of the processor better than a gap pad by a factor of two or 10 degrees from processors to heat sink."

Now GMS is ready to introduce a similar technology called Diamond RuggedCool, which uses a diamond material in the middle of the RuggedCool assembly, to increase thermal transfer and decrease thermal resistance by an additional 10 degrees Celsius from the processor to the heat sink.

Curtiss-Wright, on the other hand, essentially relies on the VITA thermal-management specs, yet keeps possibilities open to approaches that involve even wax that melts when exposed to heat, and hardens when heat levels drop, Jedynak says.

Thermal industry standards

“The VITA standards give a good idea of what is available,” says Ivan Straznicky, chief technology officer of advanced packaging at Curtiss-Wright. “It’s enough headroom in liquid flow through to meet our projected needs in the next one to five years.”

Straznicky points out that the VITA standards are the incumbents: VITA 48.1 air cooled; VITA 48.2 conduction cooled; VITA 48.5 air flow by cooling and 48.8 are air flow through cooling; and VITA 48.4 liquid flow through cooling.

“For VPX modules, those standards probably account for 90 to 95 percent of today’s designs,” Straznicky says. “The mix will be different over the next five years, with less of the air and conduction cooling, and more of the air flow through cooling.”

The Sensor Open Systems Architecture (SOSA) design guidelines, which are widely accepted by the U.S. military, has narrowed thermal-management cooling standards down, with VITA 48.2 conduction-cooled systems; VITA 48.4 liquid flow-through cooling, and VITA 48.8 air flow through cooling.



ACT has developed the ICE-Lok wedge lock that helps circuit cards dissipate heat in two directions to handle extremely hot components.

One emerging industry standard for electronics cooling, which could be formally proposed by next year, and be ready for adoption as early as 2024, is called Fluid Flow Through (FFT) cooling, which takes the complexity of air- and liquid-flow-through and puts it only at the chassis level, Straznicky says.

“You could use convection-cooled modules, and design the chassis with air- or liquid flow-through. It will allow you to separate the two, and provide really good thermal management at a more reasonable cost than a lot of air flow through or liquid flow through modules,” Straznicky says. ◀



MILPOWER
SOURCE

19 INCH RACKMOUNT RUGGED UPS



- Universal input range
- Pure sine-wave output
 - 1.25kW/1.5kVA. stackable:
 - ▶ 7.5kW single-phase
 - ▶ 3.75kW 3-phase
 - Internal EMI filter
- Advanced Battery Management System
- Safe LiFePO₄ battery chemistry

M1012 SERIES DOUBLE-CONVERSION ONLINE UNINTERRUPTIBLE POWER SUPPLY

SEE OUR
PRODUCT
OFFERING



Milpower Source offers a complete line of rugged power, PDU and networking solutions for military applications. Our solutions are compliant with MIL-Standards, environmental & EMI/RFI, and are field-proven in the most demanding applications.

Milpower Source 7 Field Lane Belmont, NH 03220 | 1-603-267-8865 | sales@milpower.com | www.milpower.com



L3Harris to enhance SATCOM to link surface warships to Global Information Grid

BY John Keller

SAN DIEGO – U.S. Navy communications experts are asking L3Harris Technologies Inc. to enhance satellite communications (SATCOM) for surface warships and submarines under terms of a \$13.4 million order.

Officials of the Naval Information Warfare Systems Command (NAVWAR) in San Diego are asking L3Harris in Camden, N.J., to handle specification changes, and extend the company's original Navy Multiband Terminal (NMT) contract by 19 months.

NMT is a multiband capable SATCOM terminal that provides protected and wideband communications. The next-generation SATCOM system for the U.S. and allied navies provides seamless assured connectivity between a ship's or submarine's computer network and the Global Information Grid.

It supports extremely high frequency (EHF); advanced EHF low data rate; medium data rate; extended data rate; super high frequency (SHF), Military Ka-band transmit and receive

▲ **L3Harris is helping the U.S. Navy improve satellite communications with surface warships and submarines with enhancements to the Navy Multiband Terminal (NMT).**

communications; and Global Broadcast Service receive-only communications.

The NMT is to be installed on about 300 U.S. Navy surface warships, submarines, and shore stations, replacing several existing SATCOM systems. It provides naval com-

manders and warfighters with data throughput capacity and protection against enemy intercepts.

The system provides protected two-way networked SATCOM for shipboard computer networks using low-, medium-, and extended-data-rate waveforms under the extremes of shipboard motion.

On this order L3Harris will do the work in Salt Lake City; Camden, N.J.; Tempe, Ariz.; Hanover, Md.; San Diego, Bonita Springs, Fla., and Chambersburg, Pa., and should be finished by July 2027 if the Navy exercises all the contract's options. ◀

For more information contact L3Harris online at www.l3harris.com, or NAVWAR at www.navwar.navy.mil.



Northrop Grumman to flight-test sensors that cover the entire electromagnetic spectrum

BY John Keller

WRIGHT-PATTERSON AFB, Ohio – U.S. Air Force researchers needed a company to flight-test experimental technologies from the Multi-Spectral Sensing Technologies Research and Development (MuSTeR) program to develop RF and electro-optical sensors for offensive, defensive, and integrated offensive and defensive systems. They found their solution from the Northrop Grumman Mission Systems segment in Linthicum, Md.

Officials of the Multispectral Sensing & Detection Division of the Air Force Research Laboratory Sensors Directorate at Wright-Patterson Air Force Base, Ohio, announced a \$840,429 contract to Northrop Grumman last week as part of the Multi-Spectral Sensing Technologies R&D (MuSTeR) program.

MuSTeR seeks to enhance the state-of-the-art in U.S. military sensor system research by using the entire electromagnetic spectrum to deliver next-generation capabilities for global persistent awareness.

MuSTeR is developing infrared search and track (IRST) technology, for example, to enable U.S. and allied aircraft to search for airborne targets without giving away their presence by emitting RF and microwave energy.

The project also focuses on improved RF sensing systems for situational awareness and targeting applications, as well as developing an advanced large-format high-dynamic-range long

▲ **MuSTeR will enhance military sensors by using the entire electromagnetic spectrum to deliver next-generation capabilities for global persistent awareness.**

wave infrared (LWIR) digital pixel readout integrated circuit (DPROIC) for airborne infrared and track (IRST) applications.

For this contract Northrop Grumman experts will support test flight of sensor systems. Other MuSTeR contractors are looking

into low-cost infrared search and track (LC-IRST) system design tradeoffs, cloud clutter suppression algorithms and processing, and machine learning techniques with the potential to improve overall IRST detection performance.

Northrop Grumman also will provide flight-test support for current and future advancements in large format focal plane arrays, read-out architectures, sensor chip assembly designs, wide-field-of-view optical designs, and advanced processing methods for target detection and tracking at range and in clutter that exploits the high frame rate advantages of a staring system.

Other focus areas of the MuSTeR program for which Northrop Grumman will provide flight support are multiband multifunction radio frequency sensing; laser radar technology; passive radio frequency sensing; and distributed radio frequency sensing. ◀

For more information contact Northrop Grumman Mission Systems online at www.northropgrumman.com, or the Air Force Research Laboratory at www.afrl.af.mil.

Wanted: enabling technologies in artificial intelligence (AI) and machine automation

BY John Keller

ARLINGTON, Va. – U.S. military researchers are asking the defense industry to develop revolutionary enabling technologies for land, sea, air, and space applications that would put U.S. forces far ahead of any potential adversaries.

Officials of the U.S. Defense Advanced Research Projects Agency (DARPA) in Arlington, Va., issued a broad agency announcement last week (HR001121S0029) for another part of the Redefining Possible project, which places heavy reliance on artificial intelligence (AI) and machine automation.

Potential U.S. adversaries such as Russia and China have developed ways to counter today's U.S. military systems that are built around exquisite, monolithic integrated systems. Instead, DARPA researchers want to develop revolutionary system architectures that

▲ **The DARPA Redefining Possible project seeks to develop revolutionary enabling technologies for land, sea, air, and space applications.**

are separate, dispersed, disruptive, and that instill doubt in U.S. adversaries.

DARPA experts want to identify promising technologies and move them quickly to the next phase of research and develop-

ment. Technologies should improve resilience, responsiveness, range, lethality, access, endurance, and affordability to enable new joint force warfighting concepts. Many of these technologies rely on AI and machine autonomy.

For aircraft, researchers point out that traditional stealth technologies are approaching their limits, and that potential adversaries have developed several different countermeasures to U.S. stealth aircraft technologies.

Moreover, DARPA officials say they are interested in systems to counter the proliferation of advanced integrated air defense

systems (IADS), including extremely capable surface-to-air and air-to-air missiles.

DARPA also is interested in aircraft-related enabling technologies that:

- enable next generation unmanned aerial systems;
- use distributed, disaggregated systems to reduce reliance on small numbers of exquisite platforms;
- enable timely delivery of targeting data and tactical targeting;
- enable aircraft capabilities that previously have not been exploited;
- enable levels of machine autonomy that can minimize the risk to human warfighters, and make platforms more attritable, and allow piloted and autonomous systems to operate in concert; and
- enable development and fielding systems more rapidly, such as model-based systems engineering, multi-dimensional optimization, and additive manufacturing.

For ground systems, DARPA researchers are interested in enabling technologies that:

- coordinate and plan in the presence of adversaries with limited knowledge of the environment, can handle battlefield surprises, and adapt to new events;
- protect soldiers, and extend the warfighter's range;
- amplify effects, and reconfigure to account for attrition;
- help develop autonomous systems that operating quickly;
- incorporate advances in machine autonomy for integrated manned and unmanned ground operations;
- provide small units or individual warfighters with improved mobility and lethality; and
- expand the ability for ground forces to deal with air threats, operate inside the interiors of buildings, and use natural and pre-dug subterranean environments.

For maritime systems, DARPA researchers are interested in enabling technologies that:

- enable a dispersed system-of-systems architecture that complicates an adversary's plans by reducing warfighting reliance on monolithic, high-value surface and sub-surface assets;
- organically defeat raids of sea-skimming high-speed missiles;
- counter advanced submarines, sea mines, and unmanned underwater vehicles (UUVs), and defeat advanced torpedoes;
- mature ways to protect U.S. waterways and port facilities;
- provide a persistent presence in harsh environments such as the arctic, to include long-duration, minimum maintenance, and safe navigation;
- disperse and disaggregate maritime assets using small,

inexpensive, networked vessels with in AI and machine autonomy; and

- capitalize the undersea domain to impose doubt on adversaries by projecting power into all other domains.

For space systems, DARPA is interested in enabling technologies that:

- complicate an adversary's counter-space capabilities by reducing warfighting reliance on monolithic, long lead-time, high-value space assets and instruments;
- counter emerging threats in a contested space environment;
- reduce reliance on large, expensive, and increasingly vulnerable geostationary equatorial orbit (GEO) satellites;
- exploit AI and deep learning technologies evaluate data from many satellites, and create dynamic kill chains; and
- advance material science, manufacturing, and computational techniques to reduce the size, weight, and costs. ←

Companies interested were asked to upload unclassified abstracts and proposals by 21 June 2023 to the DARPA BAA website at <https://baa.darpa.mil>. Email questions or concerns to HR001122S0040@darpa.mil. More information is online at <https://sam.gov/opp/a517e20d661b431aa933e55263a2bc42/view>.

Rugged sunlight-readable color HD display for autonomous vehicles introduced by Tru-Vu

TRU-Vu Monitors Inc. in Arlington Heights, Ill., is introducing the SRMH-13.3U 13.3-inch industrial-grade video display for mobile applications like military off-road vehicles. The SRMH-13.3U sunlight-readable 13.3-inch liquid crystal display (LCD) monitor is for use in direct bright sunlight, or in other high-ambient-light conditions. With more than 1,500 nits of brightness, the SRMH-13.3U is five to six times brighter than conventional LCD displays or televisions. The rugged SRMH-13.3U provides 1920-by-1080-pixel HD resolution; can produce clear, sharp full-color video images, even with bright sunlight directly on the screen; has rockable OSD buttons on the back panel to avoid unwanted tampering; will restart following any power loss; and offers a powder-coated steel enclosure and TRU-Tuff treatment to protect against the effects of shock and vibration. The SRMH-13.3U is for use in first-responder vehicles and autonomous vehicles, road-striping trucks, trains, and construction equipment. For more information contact TRU-Vu Monitors online at www.tru-vumonitors.com. ←

23 companies to mature enabling technologies for military command and control

BY John Keller

WRIGHT-PATTERSON AFB, Ohio – U.S. Air Force researchers are enlisting the help of 23 U.S. technology companies to mature, demonstrate, and proliferate enabling technologies for military forces eventually to respond to global threats in 15 minutes or less under terms of contracts collectively worth nearly a billion dollars.

Officials of the Air Force Life Cycle Management Center at Wright-Patterson Air Force Base, Ohio, announced the 23 companies in early July in the potential \$950 billion Joint All Domain Command and Control (JADC2) program.

This program seeks to develop and operate systems across air, land, sea, space, cyber, and electromagnetic spectrum military domains in an open-architecture family of systems that integrates several platforms to enable new warfighting capabilities.

The companies selected who will share the \$950 million are:

- ADDX Corp. in Alexandria, Va.;
- Capella Space Corp. in San Francisco;
- AT&T Corp. in Oakton, Va.;
- Applied Information Sciences Inc. in Reston, Va.;
- Atmospheric & Space Technology Research Associates LLC in Louisville, Colo.;
- Credence Management Solutions LLC in Vienna, Va.;
- Edge Technologies Inc. in Arlington, Va.;
- EOS Defense Systems USA Inc. in Huntsville, Ala.;
- Exfo America Inc. in Richardson, Texas;
- Hermeus Corp. in Atlanta;
- Ierus Technologies Inc. in Huntsville, Ala.;
- Cyberspace Solutions LLC in Herndon, Va.; Labelbox Inc. in San Francisco;
- Nalej Corp. in New York;
- OST Inc. in McLean, Va.;
- Praeses LLC in Shreveport, La.;
- Real-time Innovations Inc. in Sunnyvale, Calif.;
- Riverside Research Institute in New York;
- Saber Astronautics LLC in Boulder, Colo.;
- Shared Spectrum Co. in Vienna, Va.;
- Shield AI Inc. in San Diego;
- Skylight Inc. in Sarasota, Fla.;
- Sparkcognition Government Systems Inc. in Austin, Texas;
- Tenet 3 LLC in Dayton, Ohio;
- Trace Systems Inc. in Vienna, Va.;
- Ultra Electronics Advanced Tactical Systems Inc. in Austin, Texas; and
- BrainGu in Grand Rapids, Mich.

These companies will share as much as \$950 million over the next three years to mature, demonstrate, and proliferate capability across military systems and domains; as well as capitalizing on open-systems design, modern software, and algorithm development to enable JADC2.

These contracts provide awardees the opportunity to compete for efforts to develop and operate systems as a unified force across military air, land, sea, space, cyber, and electromagnetic spectrum domains in an open-architecture family of systems.

The Joint All Domain Command & Control (JADC2) — formerly referred to as Multi-Domain Operations (MDO) — seeks to develop technologies for multi-domain operations designed for real-time data collection, validation, and analysis; artificial intelligence (AI)-based human-augmented decision making; data security, identity, and trusted access; and real-time communications via decentralized network automation to speed-up military decision support, decision making, and communications. ◀



▲ 23 U.S. companies will share \$950 million to develop enabling technologies for military forces eventually to respond to global threats in 15 minutes or less.

On these contracts, the companies will do the work at locations to be determined at the contract direct order level, and should be finished by May 2025. For more information contact the Air Force Life Cycle Management Center at www.afllcmc.af.mil.



VIEW EXCLUSIVE CONTENT

Update your subscription to include our Digital Edition and gain access to exclusive articles, promotions, updates, videos and more... You will receive an email each month when the Digital Issue is released.

DON'T MISS THE NEXT ISSUE!

UPDATE YOUR SUBSCRIPTION

militaryaerospace.com/subscribe



Raytheon to build Standard missiles with electro-optical guidance for missile defense

BY John Keller

DAHLGREN, Va. – Raytheon Technologies Corp. will build surface warship- and land-based missiles designed to acquire, track, and destroy incoming ballistic missiles under terms of an \$866.6 million contract.

Officials of the U.S. Missile Defense Agency in Dahlgren, Va., are asking the Raytheon Missile Systems segment in Tucson, Ariz., to manufacture and assemble RIM-161 Standard Missile-3 Block IIA missiles for the U.S. military and the government of Japan.

The Standard Missile-3 is a Navy hit-to-kill ballistic missile defense interceptor designed to destroy short- to intermediate-range ballistic missiles. It uses an exoatmospheric kill vehicle that crashes into the incoming ballistic missile target during its mid-course phase in space.

The Standard Missile-3 Block IIA interceptor guidance system has a new kill vehicle with new solid throttling divert and attitude control system (SDACS), upgraded communications, and an improved two-color electro-optical seeker. Measuring 21.5 feet long and 21 inches in diameter, the missile is about the size of a telephone pole.

The Block IIA seeker has more than double the sensitivity and more than three times the divert capability of the Block IB, MDA officials say. Its sensitivity and ability to communicate with the ground enable the IIA interceptors to act as additional sensors to help other interceptors discriminate between real inbound ballistic missile warheads and decoys.

The massive collision of the kill vehicle hitting its target obliterates the incoming ballistic missile and its warheads, Raytheon officials say; explosives are not necessary. The resulting impact is the equivalent of a 10-ton truck traveling at 600 miles per hour.

The Standard Missile-3 launches from the U.S. Navy Vertical Launch System (VLS) aboard Navy destroyers and cruisers, as well as from Aegis Ashore sites. The missile has an enhanced two-color infrared seeker and upgraded steering and propulsion capability that uses short bursts of precision propulsion to direct the missile toward incoming targets.

Raytheon is building the next-generation Standard Missile-3 Block IIA in cooperation with Japan for deployment on land and at sea. It has two distinct new features: larger rocket motors that will enable it to defend broader areas from ballistic missile threats and a larger kinetic warhead than previous versions.

On this contract Raytheon will do the work in Tucson, Ariz.; and Huntsville, Ala., and should be finished by December 2026. For more information contact Raytheon Missile Systems online at www.raytheonmissilesanddefense.com, or the Missile Defense Agency at www.mda.mil. ◀

◀ **Raytheon is building RIM-161 Standard Missile-3 Block IIA missiles for the U.S. military and the government of Japan.**



Knight's Armament to build long-range sniper's rifles and electro-optical sights

BY John Keller

NEWARK, N.J. — U.S. Army small arms experts needed long-range sniper's rifles and electro-optical sights to enable military marksmen to hit targets from as far away as half a mile. They found their solution from Knight's Armament Co. in Titusville, Fla.

Officials of the Army Contracting Command-New Jersey in Newark, N.J., announced a \$15 million order to Knight's Armament for the M110 Semi-Automatic Sniper System and various M110 configurations.

The M110 Semi-Automatic Sniper System (M110 SASS) is intended to replace the M24 sniper weapon system for U.S. Army and Marine Corps snipers, spotters, designated marksmen, or squad advanced marksmen. The semi-automatic precision rifle is chambered for the 7.62 by 51-millimeter NATO round. It is accurate to 1.1 inches at 300 feet.

The rifle uses the AN/PVS-29 Clip-on Sniper Night Sight (Clip-on SNS) military electro-optical system, which is an image-intensified passive night-vision targeting scope designed to help military snipers find and shoot targets during low light conditions and at night, without removing the day optical sight.

▲ **The M110 Semi-Automatic Sniper System uses the AN/PVS-29 Clip-on Sniper Night Sight, which is an image-intensified passive night-vision targeting scope.**

The AN/PVS-29 uses a variable-gain image tube that the sniper can adjust for ambient light conditions. When used with the M110 day optical sights, it provides for personnel-sized target recognition at quarter moon illumination in clear air to a range of 600 meters. It is powered by two AA batteries.

The night-vision scope weighs 3.5 pounds, focuses from 25 meters to infinity, and helps snipers recognize targets as far away as 2,000 feet. Knights Armament will do the work in Titusville, Fla., and should be finished by February 2016.

The Clip-on SNS enables military snipers to maintain the current level of accuracy with the M110 rifle and to fire accurately to within 1 minute of angle. Use of the Clip-on SNS does not affect the zero of the day optical sight and allows the M110 SASS to maintain bore sight throughout the focus range of the Clip-on SNS and the M110 day optical sight. ◀

For more information contact Knights Armament online at www.knightarmco.com, or the Army Contracting Command-New Jersey at <https://acc.army.mil/contractingcenters/acc-nj>.



Navy asks Raytheon to build missile with imaging infrared seeker and fire control

BY John Keller

WASHINGTON – Surface warfare experts at Raytheon Technologies Corp. will continue developing the U.S. Navy's next-generation anti-ship and land-attack missile for the littoral combat ship, FFG(X) future multimission guided-missile frigate, and other vessels under terms of a \$57.1 million order.

Officials of the Naval Sea Systems Command in Washington are asking the Raytheon Missiles & Defense segment in Tucson, Ariz., for the Over-the-Horizon Weapon System (OTH-WH).

Raytheon engineers will build and deliver OTH-WH encanistered missiles loaded into launching mechanisms and a fire-control suite. Raytheon won a potential \$847.6 million contract in June 2018 for the OTH-WH project.

The missile has an imaging infrared seeker, an onboard target database, and navigates by Global Positioning System (GPS), inertial sensors, and terrain-reference systems. It can detect, recognize, and discriminate among targets independently, and is designed to strike enemy ships at or near the water line to inflict maximum structural damage.

Raytheon is building the new missile in partnership with Kongsberg Gruppen in Kongsberg, Norway. The missile is to equip the littoral combat ship and FFG(X) future frigate with stand-off surface-to-surface weapons capability.

Raytheon and Kongsberg in their initial OTH-WH bid offered the Naval Strike Missile (NSM) -- a fifth-generation long-range, precision-strike missile that offers strike capability against heavily defended land and sea targets. NSM is a modernized version of the Norwegian Penguin anti-ship missile.

▲ **The OTH-WH missile has an imaging infrared seeker, an onboard target database, and navigates by Global Positioning System (GPS), inertial sensors, and terrain-reference systems.**

The passive subsonic sea-skimming missile can penetrate advanced enemy defense systems, and has an upgraded seeker and target identification, Raytheon officials say. The NSM is aboard Norway's new frigate and coastal corvette, and gives surface warships sufficient firepower to defeat evolving threats.

The NSM uses composite materials for enhanced stealth, and a titanium-alloy blast-and-fragmentation warhead with void-sensing programmable intelligent multi-purpose fuze for use against hard targets like surface ships.

Aboard ships, NSMs can be deck-mounted in packs of one, two, three, four, or six launchers. The NSM weighs about 880 pounds and has a range of about 100 nautical miles. It can be used in littoral waters near coasts, or in the open ocean. The missile can fly over and around land masses, travel in sea-skim mode, and then make random maneuvers in terminal phase to avoid enemy countermeasures.

Raytheon will build a NSM fire-control suite with operator interface, interfaces to the launchers, engagement planning system, and interface to host ship systems like GPS and inertial navigation systems. Its fire-control system will be able to launch from four to 16 missiles.

On this order Raytheon and Kongsberg will do the work in Kongsberg and Raufoss, Norway; Tucson, Ariz.; Schrobhausen, Germany; Louisville, Kentucky; De Soto, Texas; and Huntsville, Ark., and should be finished by September 2025. ◀

For more information contact Raytheon Missiles & Defense online at www.raytheonmissilesanddefense.com, Kongsberg Gruppen at www.kongsberg.com, or Naval Sea Systems Command at www.navsea.navy.mil.



MISSILE SEEKERS

▲ Lockheed Martin picks BAE Systems for missile seekers for LRASM targeting

Munitions guidance experts at the BAE Systems Electronic Systems segment in Nashua, N.H., will provide next-generation missile seekers for the Long Range Anti-Ship Missile (LRASM) under terms of a \$38 million contract from Lockheed Martin Corp.

The BAE Systems advanced RF and microwave sensor enables LRASM to strike high-value maritime targets from long range in aggressive electronic warfare (EW) jamming environments.

The seeker comprises long-range sensors and targeting technology that help the stealthy missile find and engage protected enemy ships amid attempts to jam or spoof the missile, BAE Systems officials say.

LRASM is for use against high-priority enemy targets like aircraft carriers, troop transport ships, and guided-missile cruisers. The LRASM anti-ship missile contract will support missiles for the U.S. Navy, Air Force, and U.S. allies.

The BAE Systems LRASM seeker uses sensor fusion to blend information from the missile's on-board radar, semi-autonomous guidance, Global Positioning System (GPS) satellite navigation, high-speed secure tactical networking links, and nearby sensors to strike high-value targets from long range while avoiding shipboard missile counter-fire.

The missile guidance sensor uses semi-autonomous guidance and target cueing data to locate and attack targets precisely and reduce reliance on airborne intelligence, surveillance, and reconnaissance (ISR) aircraft, networking links, and GPS navigation.

BAE Systems designers also are working to make the seeker system smaller, more capable, and more efficient to produce. Building LRASM is the Lockheed Martin Missiles and Fire Control segment in Orlando, Fla. Lockheed Martin is in charge of LRASM overall development, and the BAE Systems is developing the LRASM onboard sensor systems.

LRASM is a joint project of the U.S. Defense Advanced Projects Agency (DARPA) in Arlington, Va., the Navy, and the Air Force to design an advanced anti-ship missile that can launch from B-1B Lancer jet bombers, F/A-18E/F Super Hornet jet fighter-bombers, F-35 Lightning II strike fighters, P-8A Poseidon maritime patrol aircraft, and surface vessels via the Mark 41 Vertical Launching System (VLS).

The missile travels at high subsonic speeds, and likely will give way in the future to expected new generations of hypersonic missiles. Submarine-launched versions are under consideration.

LRASM is designed to detect and destroy high-priority targets within groups of ships from extended ranges in electronic warfare jamming environments. It is a precision-guided, anti-ship standoff missile based on the Lockheed Martin Joint Air-to-Surface Standoff Missile-Extended Range (JASSM-ER).

The advanced anti-ship missile is intended to replace the ageing Harpoon anti-ship missile. It has a multi-mode radio frequency sensor, a new weapon data-link and altimeter, and an uprated power system.

The LRASM can be guided toward enemy ships from as far away as 200 nautical miles by its launch aircraft, can receive updates via its datalink, or can use onboard sensors to find its target. LRASM will fly towards its target at medium altitude then drop to low altitude for a sea skimming approach to counter shipboard anti-missile defenses.

The LRASM uses on-board targeting systems to acquire the target independently without the presence of intelligence or supporting services like GPS satellite navigation and data links. Lockheed Martin is designing the missile with advanced counter-countermeasures to evade hostile active defense systems.

The Lockheed Martin LRASM has a 1,000-pound penetrator and blast-fragmentation warhead, multi-mode sensor, weapon data link, and enhanced digital anti-jam global positioning system to detect and destroy selected surface targets within groups of ships.

LRASM development is in response to a gap in Navy anti-ship missile technology identified in 2008. The standard Navy anti-ship missile is the subsonic Harpoon, which has been in the inventory since 1977.

On this contract BAE Systems will do the work in Wayne, N.J.; Greenlawn, N.Y.; and Nashua, N.H. For more information contact BAE Systems online at www.baesystems.com, or Lockheed Martin Missiles and Fire Control at www.lockheedmartin.com.

SENSORS

► Lockheed Martin to upgrade electro-optical targeting sensors in AH-64 Apache helicopter

U.S. Army aviation experts needed electro-optical assemblies to upgrade the Target Acquisition Designation Sight/Pilot Night Vision Sensor (M-TADS/PNVS) system, also known as Arrowhead. They found their solution from Lockheed Martin Corp.

Officials of the Army Contracting Command at Redstone Arsenal, Ala., announced a \$22.1 million order to the Lockheed Martin Rotary and Mission Systems segment in Orlando, Fla., for Modernized Day Sensor Assembly (M-DSA) kits and spare parts for Army AH-64 Apache attack helicopters.

The lower M-TADS turret contains the targeting system, which has day and night electro-optical sensors. The M-DSA has updated laser rangefinder designator, TV Sensor, and laser spot tracker components — elements of which were designed in the 1970s.

The M-DSA kits are helping to upgrade the entire DSA system to enhance performance, mitigate the effects of obsolescence, and increase the M-TADS/PNVS ability to accommodate weapons now in production.

The Arrowhead targeting sensor suite, deployed in 2005, modernized the forward looking infrared (FLIR) elements of the TADS and the PNVS. This modernization effort will provide modern technological and precision engagement, and will ensure the Army's Apache helicopter remains an effective attack helicopter well into the future.

Its laser rangefinder designator includes an eye-safe rangefinder and day sensor electronics unit, which replace the laser transceiver unit and related electronics in the Apache's legacy day sensor assembly.

The new day sensor structure assembly offers fields of view that match the Arrowhead FLIR fields of view to accommodate image blending. The modernized TV sensor incorporates color and low-light sensitivity. A modern inertial measurement unit replaces three spinning-mass gyros, and the new laser spot tracker uses a four-quadrant detector and improved processing. A laser pointer marker helps enhance coordination with ground and air units.

M-DSA upgrades enable Apache flight crews to identify targets at long ranges through an additional field of view and extended range picture-in-picture capability, as well



as provide the ability to view high-resolution, near-infrared and color imagery on cockpit displays.

M-DSA also provides a new laser pointer marker that improves coordination with ground troops, and an updated multimode laser with eye-safe lasing capability that supports flight in urban environments and home-station training.

M-TADS/PNVS provides Apache helicopter pilots with long-range, precision engagement and pilotage capabilities for mission success and flight safety during day and night and in adverse weather conditions.

On this order Lockheed Martin will do the work in Orlando, Fla., and should be finished by November 2024. For more information contact Lockheed Martin Rotary and Mission Systems online at www.lockheedmartin.com, or the Army Contracting Command <https://acc.army.mil/contractingcenters/acc-rsa/>.

SOFTWARE

▼ U.S. military picks Corvid Technologies for software in missile defense

U.S. missile defense experts needed software support for a variety of ballistic missile defense tests. They found their solution from Corvid Technologies LLC in Mooresville, N.C.

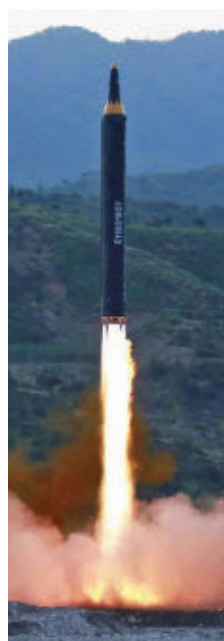
Officials of the U.S. Missile Defense Agency (MDA) in Dahlgren, Va., announced a potential \$44 million contract to Corvid Technologies to provide mathematical algorithm development, computational analysis, and range safety analysis support for MDA flight tests.

The MDA's mission is to develop an integrated layered ballistic missile defense system to defend the U.S., its deployed forces, friends, and allies from ballistic missiles of all ranges and in all phases of flight.

The MDA's test and measurement program provides critical data to demonstrate the effectiveness, suitability, and survivability of the Ballistic Missile Defense System (BMDS).

Testing also contributes to U.S. non-proliferation goals by sending a credible message to the international community on U.S. ability to defeat ballistic missiles in flight.

Testing is a continuous, evolutionary process that encompasses



developmental and operational activities. The process begins with testing of system elements and components and progresses to end-to-end testing of the integrated system as a combination of interceptor and sensor systems linked by a sophisticated command and control architecture.

As testing progresses, each test builds on knowledge gained from previous tests, adds increasingly challenging goals, and becomes more operationally realistic.

The test program uses models and simulations to assess system configurations, engagement conditions, and target phenomena. Flight and ground testing provides essential data to validate the accuracy of models and simulations.

Exercises and wargames help military commanders prepare concepts of operations; tactics, techniques, and procedures; doctrine; and training on current and evolving BMDS capabilities.

Testing provides warfighters with confidence in the basic design of the BMDS, its hit-to-kill effectiveness, and its inherent operational capability.

On this contract Corvid Technologies will do the work in Mooresville, N.C., and should be finished by June 2027. For more information contact Corvid Technologies online at www.corvidtec.com, or the Missile Defense Agency at www.mda.mil.

EMBEDDED COMPUTING

► Boeing to provide processors for signal-processing computer network for combat jets

U.S. Navy combat avionics experts are asking the Boeing Co. to provide components for data- and signal-processing targeting computer for the F/A-18E/F Super Hornet jet fighter-bomber and EA-18G Growler electronic warfare (EW) jet under terms of a \$43.8 million order.

Officials of the Naval Supply Systems Command's Weapons Systems Support segment in Philadelphia are asking the Boeing Defense, Space & Security segment in St. Louis to provide 72 each of processor and target I/O for the Distributed Targeting Processor-Network (DTP-N) system on Super Hornet and Growler aircraft.

The DTP-N from the L3Harris Technologies Inc. Space & Airborne Systems segment in Palm Bay, Fla., is a high-performance data and signal processing computer that bridges gaps between Hornet and Growler onboard

and external data networks in real time. The DTP-N is 17-times more powerful than the previous systems.

DTP-N helps reduce pilot workload by providing actionable information on the Super Hornet and Growler large-area display. It has the power to compute algorithms quickly to deal with the complex battlespace of the future, L3Harris officials say.

It provides performance scalability, technology insertion, and functional growth capability via an open-systems architecture design. It also has multiple levels of security and complies with standard electronics architectures for Super Hornet and Growler aircraft.

Multilevel security supports multiple security trusted computing enclaves on the aircraft, and provides secure interoperability among several subsystems.

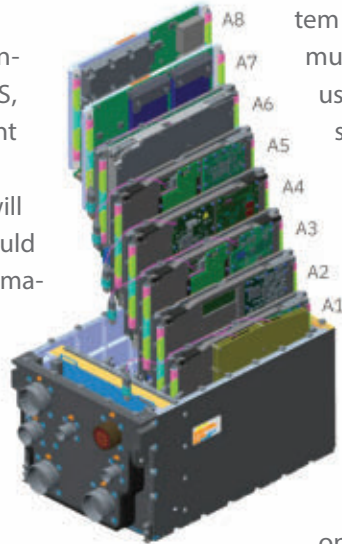
The DTP-N improves mission processing, subsystem interfacing, display generation, and secure, multilevel information management. It hosts user-generated software with third-party and supplier-provided software.

The DTP-N computer provides a gateway from existing F/A-18E/F and EA-18G avionics to new external radio frequency tactical networks. Connection to the Tactical Targeting Network Technology (TTNT) through MIDS-JTRS Ethernet interfaces helps increase bandwidth to collect and share time-critical information using streaming video and still imagery.

The DTP-N is an eight-slot 6U VPX avionics computer that can process information at speeds to 919 billion floating point operations per second. It has seven 10GBase-SR fiber-optic ports and 11 copper 10/100/1000Base-T Ethernet ports. The computer uses the VxWorks real-time operating system from Wind River Systems in Alameda, Calif.

The computer measures 9.35 by 14 by 7.6 inches, and weighs 41 pounds. It meets VITA 46 and VITA 48.2 standards, as well as MIL-STD-1472, MIL-STD-704E, MIL-STD-461F, and MIL-STD-810.

On this contract Boeing will do the work in St. Louis, and should be finished by December 2025. For more information contact Boeing Defense, Space & Security online at www.boeing.com/company/about-bds, or the Naval Supply Systems Command's Weapons Systems Support segment at www.navsup.navy.mil/NAVSUP-Enterprise/NAVSUP-Weapon-Systems-Support. ◀



DISPLAY PROCESSORS

► Open-systems large display processor introduced by RGB Spectrum

RGB Spectrum Inc. in Alameda, Calif., is introducing the Zio 4000 video wall processor with advanced networking capabilities to enable complex visualization and enhanced situational awareness. The Zio 4000 is available as a stand-alone video wall or integrated with the RGB Spectrum AV-over-IP distribution platform. The Zio 4000 large display processor simultaneously displays several video sources onto any size video wall or across several walls, with various size models supporting from two to 128 displays. As an open-systems platform, users can select streams from non-proprietary video sources like cameras, computers, video teleconferencing systems, and media players. The processor scales the sizes of display windows to as large as the full wall or as small as a thumbnail. For interoperability, the Zio 4000 supports base-band video sources like HDMI, DisplayPort, and SDI, as well as industry-standard AV-over-IP video sources like H.264—including third-party streaming devices. The Zio 4000 offers an intuitive user-interface with thumbnail views of available inputs, customized presets, and drag and drop control. The browser-based interface eliminates the need for additional software or constant maintenance. For more information contact RGB Spectrum online at www.rgb.com.



COUNTER-UNMANNED

▼ Counter-drone system to detect UAV signals introduced by Rhode & Schwarz

Rohde & Schwarz in Munich is introducing the Ardronis counter-drone system and ADD557SR direction finding and monitoring antenna to detect commercial unmanned aerial vehicle (UAV) activity across a wide frequency

range. The Ardronis counter-drone system and ADD557SR antenna cover the frequency range from 20 MHz to 6 GHz, and display a list of all active remote-control signals detected in frequency bands for commercial-grade drone data links. The Ardronis can separate a selected remote-control drone signal from others with a profile-based auto-separation algorithm that detects and locates the signal. The separate receiving antenna has an optional integrated lightning rod and an integrated compass with optional GPS. For more information contact Rohde & Schwarz online at www.rohde-schwarz.com.



COMMUNICATIONS

► Infineon blends Wi-Fi and Bluetooth into NVIDIA Jetson processor

Infineon Technologies AG in Munich is bringing the company's AIROC Wi-Fi and Bluetooth connectivity solutions to the NVIDIA Jetson processor for artificial intelligence (AI) applications on the leading edge of the battlefield. NVIDIA Jetson is an AI-at-the-edge embedded computing system that uses pre-trained AI models, developer SDKs, and support for cloud-native technologies to help systems designers build and deploy software-defined features on embedded and edge devices. AI-at-the-edge devices require Wi-Fi cloud connectivity for life cycle management functions like deploying AI models through over-the-air updates. Infineon's AIROC Wi-Fi and Bluetooth combo provides Wi-Fi 6/6E and low-power Wi-Fi 5 integrated with NVIDIA Jetson system-on-modules. Many AI applications require real-time blending effects from live action to computer-generated images or videos. The device must process and stream data simultaneously. In these applications, high-throughput and low-latency wireless transmissions are critical. Infineon's Wi-Fi 6E solution, operating in the 6-to-7 GHz band, minimizes the latency and prevents interruptions due to congested wireless networks. For more information contact Infineon Technologies online at www.infineon.com.

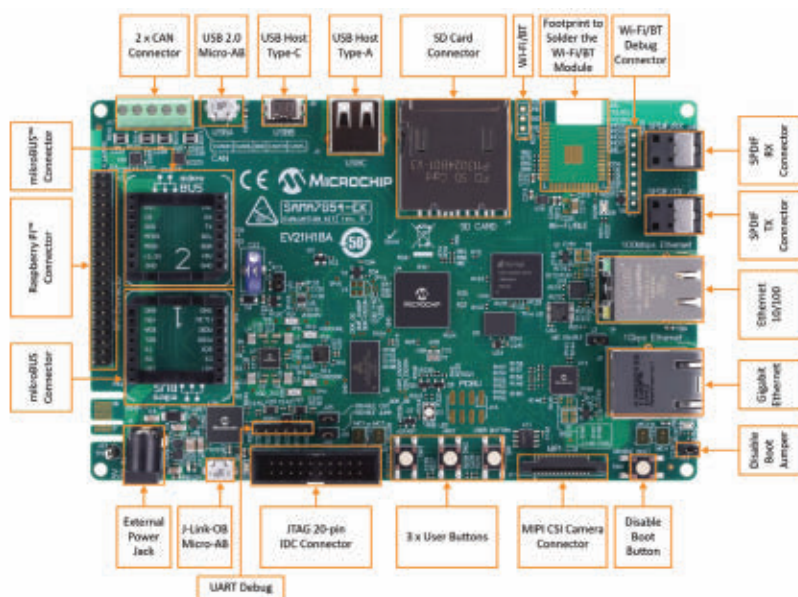


MICROPROCESSORS

▼ Arm Cortex microprocessor for AI, imaging, and audio introduced by Microchip

Microchip Technology Inc. in Chandler, Ariz., is introducing the SAMA7G54 Arm Cortex A7-based microprocessor that runs as fast as 1 GHz for low-power stereo vision applications with accurate depth perception. The SAMA7G54 includes a MIPI CSI-2 camera interface and a traditional parallel camera interface for high-performing yet low-power artificial intelligence (AI) solutions that can be deployed at the edge, where power consumption is at a premium. AI solutions often require advanced imaging and audio capabilities which typically are found only on multi-core microprocessors that also consume much more power. When coupled with Microchip's MCP16502 Power Management IC (PMIC), this microprocessor enables embedded designers to fine-tune their applications for best power consumption vs. performance, while also optimizing for low overall system cost. The MCP16502 is supported by

Microchip's mainline Linux distribution for the SAMA7G54, allowing for easy entry and exit from available low-power modes, as well as support for dynamic voltage and frequency scaling. For audio applications, the device has audio features such as four I2S digital audio ports, an eight-microphone array interface, an S/PDIF transmitter and receiver, as well as a stereo four-channel audio sample rate converter. It has several microphone inputs for source localization for smart speaker or video conferencing systems. The SAMA7G54 also integrates Arm TrustZone technology with secure boot, and secure key storage and cryptography with acceleration. The SAMA7G54-EK Evaluation Kit (CPN: EV21H18A) features



NEW PRODUCTS

connectors. For more information contact Microchip online at www.microchipdirect.com.

RUGGED COMPUTERS

► Rugged laptop computer for military and first responders introduced by Panasonic

Panasonic Connect North America in Newark, N.J., is introducing the TOUGHBOOK 40 rugged modular laptop computer for military users, mobile workers law enforcement, federal agencies, and utilities to improve efficiency and reduce operational costs. TOUGHBOOK 40 is more than a pound lighter than the previous generation. It has 14-inch FHD touchscreen display for increased readability for military personnel who need to decipher precise and intricate plans. The TOUGHBOOK 40 comes with 11th Gen Intel vPro processors, with optional AMD dedicated graphics or



Intel Iris Xe Graphics boosting computing power to process large amounts of data, images, and video feeds in real-time. The TOUGHBOOK 40 also has a 5-megapixel webcam, privacy cover for security, and infrared capability to support Windows Hello facial recognition. It also has several cellular and connectivity options, including a 4G or 5G modem. The 4G modem supports LTE, LTE-A and speeds as fast as 2 G gigabits per second. The 5G modem supports 4G (LTE, LTE-A) as well as 5G (mmWave, C-band, Sub6) and speeds to 5.5 gigabits per second. It connects to the best available network without any disruption or intervention by the user. Both 4G and 5G modems support FirstNet (band 14), CBRS Private LTE (band 48) and have dual SIM (physical SIM + eSIM). The rugged TOUGHBOOK 40 provides advanced docking support, and quad pass-through connectors. For more information contact Panasonic online at <https://na.panasonic.com/us/>. ◀

PRODUCT & LITERATURE SHOWCASE



MULTI-DOMAIN VIDEO SOLUTIONS

Video Display, Distribution, and Recording



LEARN MORE
AT RGB.COM



F-35 • FULL MISSION SIM



PHALANX • CIWS



AEGIS • SHIPBOARD COMMS



LCS • C4ISR

Better Decisions. Faster.™

ADVERTISERS INDEX

ADVERTISER	PAGE
Acromag.....	23
Airborn Inc.....	20
Apex Microtechnology Inc.....	12
Applied Avionics, Inc. I Vivisun	8
Atrenne Computing Solutions.....	31
Axiom Electronics	9
Concurrent Real-Time	10
Dawn VME Products	28
Ellsworth Adhesives	14
Elma Electronic Inc.	11, 15
Extreme Engineering Solutions.....	C4
Fairview Microwave.....	5, 27
General Micro Systems Inc.	6-7
LCR Embedded Systems Inc.....	1
Mercury Systems	C2
Milpower Source	33
Pasternack Enterprises.....	21
Phoenix International.....	49
Pico Electronics Inc.....	25
Pixus Technologies.....	22
Powell Electronics	16
Quantic PMI (Planar Monolithics Industries)	10
RGB Spectrum.....	48
Sealevel Systems Inc.....	17
Systel Inc.....	3
Thermoelectric Cooling America Corp.....	29

Military+Aerospace Electronics®

SUBSCRIPTION INQUIRIES

Phone: 1-877-382-9187 / International Callers: +1-847-559-7598

E-mail: MAE@omeda.com

Web: militaryaerospace.com/subscribe

VICE PRESIDENT/GROUP PUBLISHER Steve Beyer
847-532-4044 / sbeyer@endeavorb2b.com

EDITOR-IN-CHIEF John Keller
603 891-9117 / jkeller@endeavorb2b.com

ASSOCIATE EDITOR Jamie Whitney
603 891-9135 / jwhitney@endeavorb2b.com

CHIEF CONTRIBUTOR Megan Crouse

ART DIRECTOR Kermit Mulkins

PRODUCTION MANAGER Sheila Ward

AD SERVICES MANAGER Shirley Gamboa

AUDIENCE DEVELOPMENT MANAGER Debbie Bouley
603 891-9372 / dbouley@endeavorb2b.com



www.endeavorbusinessmedia.com

EDITORIAL OFFICES

Endeavor Business Media, LLC
Military & Aerospace Electronics
61 Spit Brook Road, Suite 501, Nashua, NH 03060
603 891-0123 / www.milaero.com

SALES OFFICES

EASTERN US & EASTERN CANADA & UK

Keith Gregory, Sales Manager
508 1/2 Ocean Park Ave., Bradley Beach, NJ 07720
732 897-9550 / Cell 917 993-3741
kgregory@endeavorb2b.com

WESTERN CANADA & WEST OF MISSISSIPPI

Maureen Elmaleh, Sales Manager
7475 Miller Street, Arvada, CO 80005
303 975-6381 / Cell 212 920-5051
melmaleh@endeavorb2b.com

DIRECTOR LIST RENTAL Kelli Berry
918 831-9782 / kberry@endeavorb2b.com

FOR ASSISTANCE WITH MARKETING STRATEGY OR AD CREATION,
PLEASE CONTACT MARKETING SOLUTIONS

SR. DIRECTOR OF PROGRAM MANAGEMENT Steve Porter
sporter@endeavorb2b.com

ENDEAVOR BUSINESS MEDIA, LLC

CHIEF EXECUTIVE OFFICER Chris Ferrell

PRESIDENT June Griffin

CHIEF FINANCIAL OFFICER Mark Zadell

CHIEF OPERATING OFFICER Patrick Rains

CHIEF ADMINISTRATIVE AND LEGAL OFFICER Tracy Kane

EVP, TECHNOLOGY GROUP Lester Craft



AS 9100D / ISO 9001:2015 CERTIFIED

**PHALANX II:
THE ULTIMATE NAS**

Supports AES-256 and FIPS140-2 encryption

Utilizing two removable SSDs, the Phalanx II is a rugged Small Form Factor (SFF) Network Attached Storage (NAS) file server designed for manned and unmanned airborne, undersea and ground mobile applications.

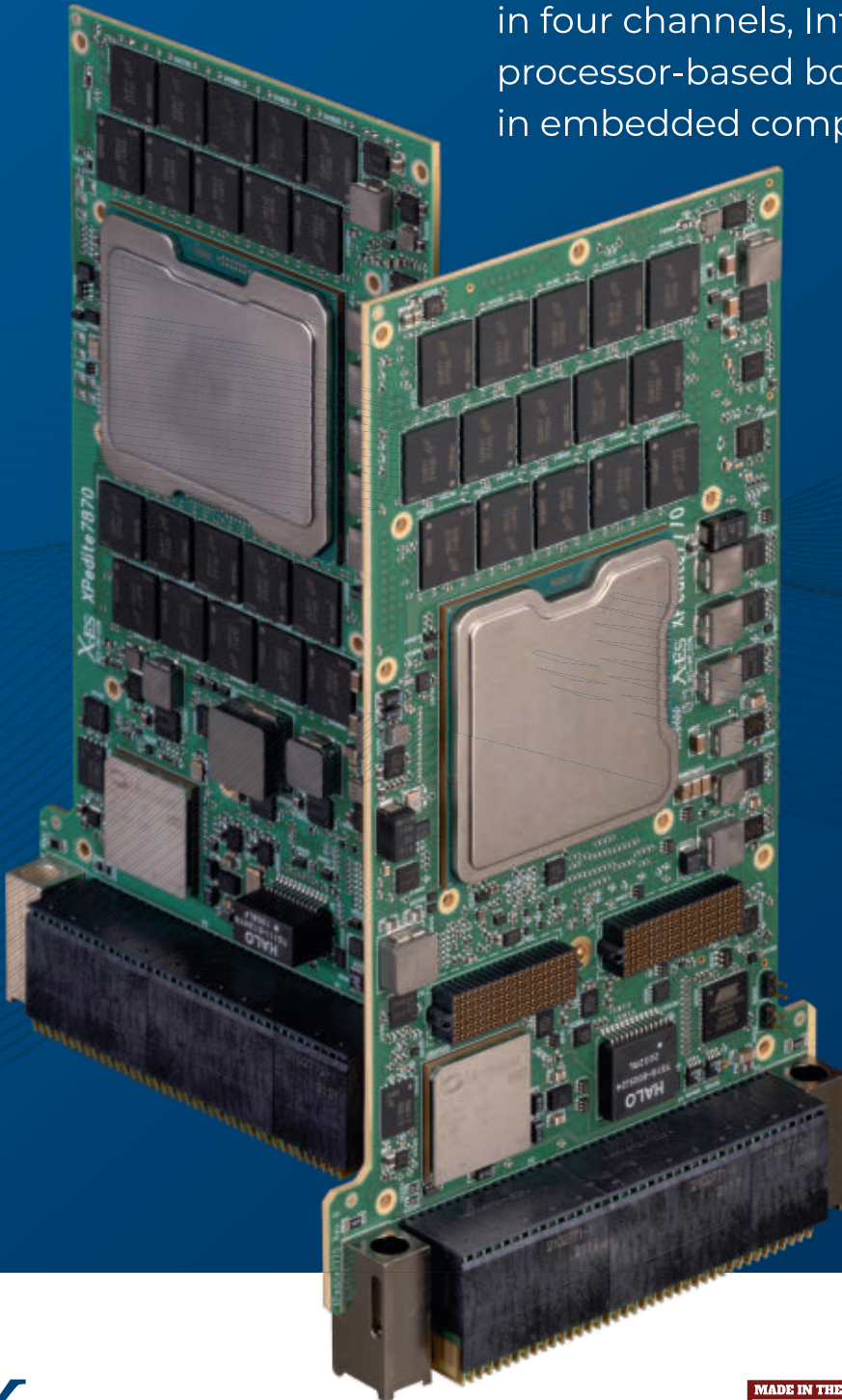
www.phenxint.com

PHOENIX INTERNATIONAL

SGS SGS ANAB

INTRODUCING INTEL® XEON ICE LAKE-D

More powerful than ever before with up to 20 cores and 64 GB of DDR4 memory in four channels, Intel® Xeon Ice Lake-D processor-based boards are the ultimate in embedded computing performance.



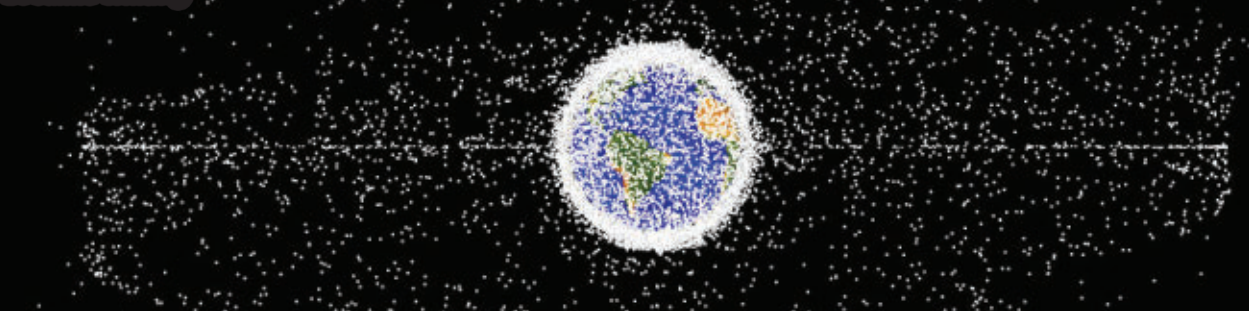
Extreme Engineering Solutions
608.833.1155 www.xes-inc.com



Designed, manufactured, and supported in the USA

NASA asks three universities to study the effects of space debris on economics, policy, and human society

BY Jamie Whitney



WASHINGTON — As part of National Aeronautics and Space Administration's (NASA's) efforts to address orbital debris, the agency announced that it is funding research proposals from three university-based teams over the next year

to analyze the economic, social, and policy issues associated with space sustainability.

Orbital debris consists of human-made objects orbiting Earth that no longer serve a purpose, including mission-related and fragmentation debris, nonfunctional spacecraft, and abandoned rocket stages.

NASA notes that these objects can endanger spacecraft, jeopardize access to space, and impede the development of a low-Earth orbit economy, including commercial participation. These new awards will fund research that supports the agency's commitment to address the problem.

"Orbital debris is one of the great challenges of our era," said Bhavya Lal, associate administrator for the Office of Technology, Policy, and Strategy (OTPS) at NASA Headquarters in Washington. "Maintaining our ability to use space is critical to our economy, our national security, and our nation's science and technology enterprise. These awards will fund research to help us understand the dynamics of the orbital environment and show how we can develop policies to limit debris creation and

▲ **NASA is sponsoring universities studies on the effects of space debris on world economics, national policy, and on human society. This illustration shows the space debris problem. NASA image**

mitigate the impact of existing debris."

A panel of experts evaluated and selected these three proposals:

— "Adaptive Space Governance And Decision-Support Using Source-Sink Evolutionary Environmental Models,"

from Richard Linares and Danielle Wood of the Massachusetts Institute of Technology, and Moriba Jah of the University of Texas-Austin;

— "An Integrated Assessment Model for Satellite Constellations and Orbital Debris," from Akhil Rao of Middlebury College, Daniel Kaffine of the University of Colorado-Boulder, and Brian Weeden of the Secure World Foundation; and

— "Communication and Space Debris: Connecting with Public Knowledges and Identities," from Patrice Kohl, Sergio Alvarez, and Philip Metzger of the University of Central Florida.

NASA's will make the teams' results publicly available on the agency's website. Selected teams also can work with the federal Organization for Economic Cooperation and Development as part of an international call for research proposals focused on orbital debris and space sustainability. ◀

For more information contact the NASA Office of Technology, Policy, and Strategy online at <https://www.nasa.gov/offices/otps/home/index.html>.

NASA seeks proposal for lunar landers to deliver astronauts to the Moon's surface

By Jamie Whitney

WASHINGTON – The National Aeronautics and Space Administration (NASA) in Washington is seeking proposals for sustainable lunar lander development and demonstration as the agency works toward a regular cadence of Moon landings as part of ongoing Artemis missions this decade and beyond.

Under the solicitation, Human Landing System Sustaining Lunar Development, NASA has provided requirements for companies interested in developing and demonstrating astronaut Moon landers. These efforts will pave the way for multiple companies to provide recurring Moon landing services beyond the Artemis III mission, which is planned for no earlier than 2025.

Companies selected under this contract will be required to perform one uncrewed and one crewed lunar landing demonstration. NASA will certify any lander system to meet its requirements prior to the crewed demonstration mission(s).

The final call for proposals comes after NASA incorporated industry feedback on the draft solicitation, released 31 March, encouraging companies to send comments to help shape a key component of the agency's human exploration Artemis architecture. NASA also hosted a virtual industry day in April to present an overview of the solicitation and to provide companies an opportunity to ask clarifying questions and provide comments.

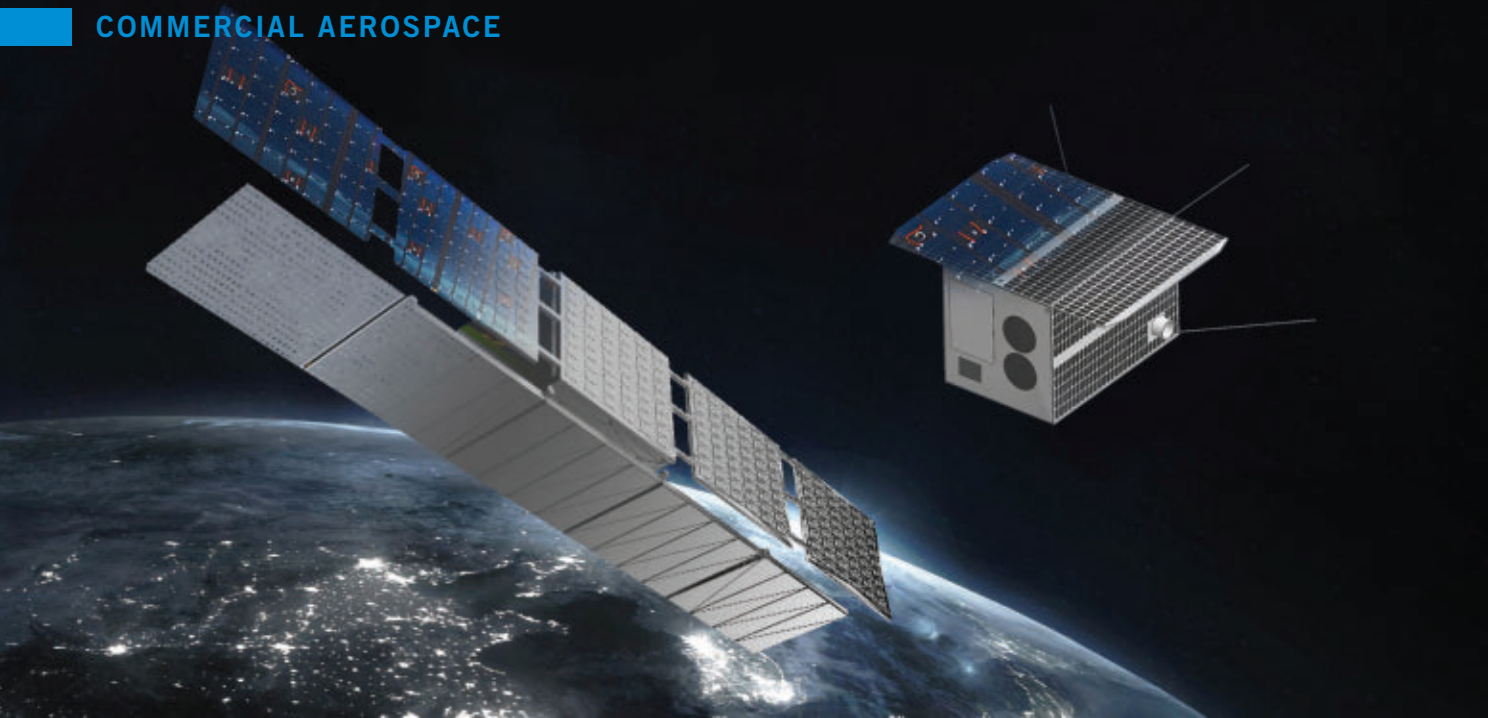
► NASA leaders are reaching out to industry for designs of a next-generation lunar lander to deliver astronauts to the surface of the moon.

NASA's existing contract with SpaceX includes both an uncrewed and a crewed lunar landing demonstration that is part of the Artemis III mission. The agency plans to exercise an option under this contract, known as Option B, asking the company to evolve its current Artemis III Starship Human Landing System design to meet an extended set of requirements for sustaining missions at the Moon and conduct another crewed demonstration landing.

These concurrent sustaining lander development efforts will meet NASA's needs for recurring, long-term access to the lunar surface, such as the ability to dock with Gateway for crew transfer, accommodate an increased crew size, and deliver more mass to the surface. ◀

Proposals for the sustainable lunar lander development and demonstration are due Nov. 15. For more information, please visit <https://www.nasa.gov/nextstep/humanlander4>, or send questions to Stacey Hadavi at stacey.e.hadavi@nasa.gov.





ICEYE and SATLANTIS announce plans to develop tandem radar and optical imaging satellites

BY Jamie Whitney

HELSINKI – ICEYE in Espoo, Finland, and SATLANTIS in Bilbao, Spain, have announced plans to work together on a proposed Tandem for Earth Observation (Tandem4EO) constellation consisting of two radar and two VHR optical satellites.

The announced program is to support the NewSpace strategy of several European Union nations, with a focus on Spain.

The companies noted that ICEYE's manufacturing and R&D facilities in Jumilla, and the headquarters of SATLANTIS in Bilbao – both in Spain – will be at the heart of the development, manufacturing and planned cooperation. Both companies will continue to increase their investments in their local operations, supporting Earth observation downstream applications in the European Union, and the growth of the local NewSpace ecosystem.

The Tandem4EO constellation is planned to be launched as a collection of four satellites in total, each capable of under 1-meter resolution imaging. The satellites are to be flown in a sun-synchronous orbit, with two ICEYE synthetic aperture radar (SAR) imaging spacecraft flying in a bistatic formation, and two SATLANTIS high-resolution optical imaging spacecraft trailing behind. The constellation intends to serve solutions related to natural catastrophes, security, environmental monitoring at land

and sea, infrastructure development, precise SAR Interferometry (InSAR) based change detection and more.

What makes the development of the Tandem4EO constellation unique is that the combination of SAR and optical imaging with video capability will enable a new level of effectiveness for assessing in detail what is happening in a location of interest right now and over time. With this dual-instrument approach, data users will gain the benefits of versatility, reliability, and ease of use. In addition, the bi-static nature of the ICEYE SAR satellites allows for simultaneous radar acquisitions to produce InSAR data.

“Spain is in a remarkable position in Europe, with two leading NewSpace companies established in its territory opening new and unique opportunities in Earth observation,” says Juan Tomás Hernani, CEO of SATLANTIS. “This proposed initiative is the type of aerospace collaboration that would not have been feasible before. We’re in the golden age of New Space, and now is the right time to act on it.” ◀

For more information contact ICEYE online at <https://www.iceye.com>, or SATLANTIS at <https://satlantis.com>.

Boeing and Wisk unveil concept of operations for Urban Air Mobility

Boeing and its joint venture partner Wisk have released a road-map for switching to a future where automated and uncrewed aircraft can safely carry passengers and cargo in urban and sub-urban areas. The concept of operations lays out the technology, regulatory and social recommendations needed to deploy urban air mobility (UAM) in the United States and integrate it into the national airspace system. Boeing and Wisk say that evolutionary and pragmatic methods will be needed to make the vision of UAM a reality. This includes the creation of new infrastructure such as 'vertiports,' locations where UAM aircraft can take off and land, load and unload passengers, and receive services. Additionally, while the aircraft will be automated, Boeing and Wisk recommend the creation of 'fleet operations centers' where 'multi-vehicle supervisors' will monitor flights, implement air traffic control instructions to maintain aircraft separation, and ensure safe operation of the flight. "The work we've done with our partners at Wisk demonstrates how this shared vision can become reality, and we're excited to share these ConOps with public, government, policy and regulatory stakeholders to engage across industry to shape that future," said Brian Yutko, Boeing vice president and chief engineer of Sustainability & Future Mobility.

FAA selects Raytheon Intelligence & Space to enhance precision aircraft navigation system

Raytheon Intelligence & Space in Arlington, Va. has been awarded a competitive indefinite delivery indefinite quantity contract from the Federal Aviation Administration (FAA) with a ceiling value of \$375 million over the next 10 years. Task orders, valued at \$215 million, were executed at contract award to provide technical refresh and Dual Frequency Operation (DFO) upgrades to the FAA's Wide-Area Augmentation System, or WAAS, a space-based precision navigation system, that will enhance safer air travel in support of the National Airspace System. AAS is a Satellite-based Augmentation System (SBAS), which provides GPS corrections for critical navigation for the aviation community, first responders and other government agencies, ensuring pilots can land safely in austere environments, despite weather challenges. It also provides corrections for SBAS-capable receivers in use across a diverse set of communities, including agriculture, maritime and surveyance, among others. Under the WAAS DFO-2 contract, RI&S

will deliver more modern processing, system security, and network architecture, while also adding dual frequency service. Raytheon Technologies notes that the company has been the prime development contractor for WAAS since 1996. Since reaching initial operational capability in 2003, Raytheon Technologies and the FAA have developed and fielded dozens of enhancements expanding WAAS's precision approach capability, coverage area, and reliability, including improvements to the system infrastructure in preparation for Dual Frequency service. WAAS Dual Frequency service will enable increased system accuracy, integrity, and availability when subject to ionospheric perturbations, including solar storms.

Qatar Airways selects Inmarsat for inflight internet on its 787-9 and 737-10 fleet

Qatar Airways in Doha sought a provider for its inflight WiFi needs. They found their solution from Inmarsat in London. Qatar Airways will adopt Inmarsat's technology in its Boeing 787-9 and 737-10 fleet. Qatar Airways has selected GX Aviation, Inmarsat's high-speed global inflight broadband service. This technology has already been rolled out successfully on other aircraft within the Qatar Airways fleet and, under the new agreement, it has already been activated on the first seven Boeing 787-9s. Qatar Airways provides one hour of free access to its 'Super Wi-Fi', powered by GX Aviation, with the option to purchase full access for the remainder of each flight. The broadband service will be available across the airline's aircraft and flight routes. With Qatar hosting the 2022 FIFA World Cup, the Middle East nation's flagship carrier aims to provide passengers with a robust internet connection as they travel for the massive international sporting event. Qatar Airways says its passengers will be able to stay up-to-date with match scores, watch video replays and even livestream games from 30,000 feet. Inmarsat is committed to meeting the bandwidth requirements generated by this forthcoming event and, alongside its partner Safran Passenger Innovations, installed and activated GX Aviation on the first Qatar Airways 787-9 aircraft in less than five months from contract award. Niels Steenstrup, President of Inmarsat Aviation, said "It has been more than four years since Qatar Airways became the launch customer for Inmarsat's GX Aviation in the Middle East and North Africa and, during that time, millions of passengers have enjoyed access to its Super Wi-Fi service. We are delighted to expand our important partnership even further. ←