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ENABLING TECHNOLOGIES FOR NATIONAL DEFENSE

Rugged computers

Onboard computing drives requirements for resistance to combat conditions. PAGE 16

Infrared sensors

Electro-optics blend with signal processing for new levels of surveillance. PAGE 23

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Obsolete parts

Mitigating parts obsolescence to extend military vehicle service life

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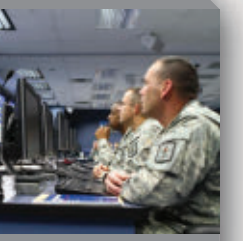
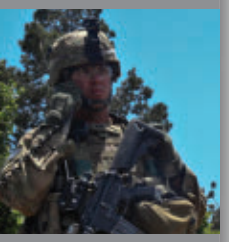


COVER STORY

Image courtesy L-3 MAS.



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BY **JOHN KELLER**, EDITOR IN CHIEF

Welcome to the new Military & Aerospace Electronics home page

Military & Aerospace Electronics is unveiling a redesigned and updated website at www.militaryaerospace.com to make it easier and faster for readers to find the news most important to them on a daily basis.

The homepage is designed to be sleek and quick to browse, with a minimum of clutter, which leads the reader to the day's most important story at the top of the page. Scroll down for the latest headlines on the left side of the page. Each item is dated so you can see at a glance which stories are the latest.

The home page lead item is the story determined by the *Military & Aerospace Electronics* editors to be the day's most important, relevant, and helpful read. The lead story can change throughout the day as editors post additional stories.

In a column down the right side of the home page are clickable icons, each representing the most important topic centers to help readers quickly find the information they need most. Topic centers are aviation technology; C4ISR; electro-optics; embedded computing; high-rel electronics; interconnect technology; land technology; power electronics; RF & microwave; sea technology; the Mil & Aero blog; space technology; test and measurement; and unmanned vehicles.

Simply click on any of the homepage icons and the site will take you to a landing page with all content on that topic, with archival material that goes back for years. All topic landing page content is organized with the latest stories first.

Scroll down below the day's headlines and topic-center icons and you'll find the stories causing the most buzz among *Military & Aerospace Electronics* readers with the most popular articles column on the left side of the page. Below on the right are lists of the latest *Military & Aerospace Electronics* Webcasts, Executive Briefings, industry white papers, latest comments about *Military & Aerospace Electronics* on social media, and ways to subscribe to *Military & Aerospace Electronics*.

It's all designed to be clean, fast, and easy to read. We're busy, and we know you are, too, so we've designed our new home page to save you time and get you the information most relevant to your job.

Want a deeper dive? Just browse the topics and departments section, which you get to by the strip at the top of the page. On the strip you can choose from home, topics, departments, print magazine, Webcasts, white papers, executive briefings, buyers' guide, and mobile applications for your smartphone and tablet.

Hover over topics and you'll see a dropdown menu that mirrors the clickable topic icons to bring you to the various topic landing pages.

Hover over departments and you'll see a dropdown menu consisting of Defense Executive, exclusive content, events, Farnborough Report, headlines, new products, news & analysis, Paris Air Show Report, press releases, print issue online, product applications, The Last Word, The Mil & Aero blog, video, and wire news.

Defense Executive is the latest business news of interest to program and executive managers. Exclusive content consists of news and opinion you won't' find anywhere other than *Military & Aerospace Electronics*. Events is a calendar of upcoming meetings, trade shows, and conferences of interest to the aerospace and defense electronics community.

Press releases have industry-relevant company announcements. Print issue is our magazine content. Product applications are design-in case studies. The Last Word is the online version of our monthly industry leader interview. The Mil & Aero blog is a listing of our blog posts, video is our collection of produced videos and Rapid Fire interviews, and wire news is what's hot on the wire.

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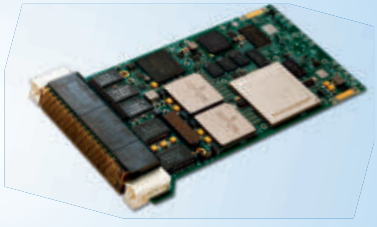

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Sikorsky, Aurora Flight Sciences take on DARPA VTOL X-Plane tiltrotor

BY JOHN KELLER

ARLINGTON, Va.—Engineers from two U.S. aeronautics companies are starting to develop a high-speed vertical takeoff-and-landing (VTOL) aircraft with the hover capability of a helicopter that can fly nearly 50 percent faster than the Boeing V-22 Osprey tiltrotor aircraft.

Sikorsky Aircraft Corp. in Stratford, Conn., and Aurora Flight Sciences in Manassas, Va., have won contracts for the initial phase of the Vertical Take-Off and Landing Experimental Plane (VTOL X-Plane) project of the U.S. Defense Advanced Research Projects Agency (DARPA) in Arlington, Va.

Sikorsky won a $14.4 million contract in November, and Aurora Flight Sciences won a $14 million contract in December for the first phase of the DARPA VTOL X-Plane program—a four-year $130 million effort to fly an experimental aircraft that flies faster than 300 knots with a hover efficiency of 75 percent or better and a cruise lift-to-drag ratio of 10 or more.

Sikorsky Aircraft and Aurora Flight Sciences will come up with designs for the DARPA Vertical Take-Off and Landing Experimental Plane (VTOL X-Plane).

During Phase 1, Sikorsky and Aurora Flight Sciences will conduct trade studies and develop the VTOL X-Plane's initial design. Sikorsky is teaming with Lockheed Martin Corp. Skunk Works in Palmdale, Calif., for the VTOL X-Plane development.

The Boeing V-22 Osprey tiltrotor is one of the first VTOL aircraft deployed with U.S. forces. It has a top speed of 275 knots. The DARPA VTOL X-Plane project has a goal of increasing VTOL aircraft speed to at least 400 knots—or

CONTINUED ON PAGE 6 ➔

IN BRIEF

BAE Systems to build fiber-optic decoys

Electronic warfare experts at the BAE Systems Electronic Systems segment in Nashua, N.H., will build 262 AN/ALE-55 fiber-optic towed decoys (FOTDs) and 70 electronic frequency converters (EFC) under terms of a $28.2 million U.S. Navy contract. The AN/ALE-55 is an RF airborne countermeasure designed to protect the F/A-18E/F Super Hornet carrier-based jet fighter-bomber from radar-guided missiles. BAE Systems began full-rate production of the AN/ALE-55 in late 2011. The aircraft-towed decoy with onboard electronics works with the Super Hornet's electronic warfare system to jam radar seekers in air-to-air missiles.

Air Force seeks to give a bigger bite to B-52H bomber firepower

U.S. Air Force bomber experts are surveying industry to find companies with the expertise to upgrade power control and distribution systems aboard the B-52H jet bomber to apply MIL-STD-1760 power to the B-52H's bomb-bay and underwing weapons. With upgrades, the aircraft could carry a variety of independently targeted smart weapons in its bomb bay and on underwing pylons, and could attack several targets in one pass. ←

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DHS lays out six-point research plan for airport, passenger, and freight security technology

BY JOHN KELLER

WASHINGTON—Research leaders at the U.S. Department of Homeland Security (DHS) in Washington are releasing a six-point plan to focus research on technologies to safeguard the U.S. from terrorist threats to trade and travel. The plan involves the DHS Homeland Security Advanced Research Projects Agency (HSARPA) and the Transportation Security Administration (TSA).

The HSARPA/TSA Strategic Plan will focus DHS technology-development resources on six areas with the best potential to improve airport security, transportation security, and other parts of the nation's travel and trade infrastructure. The six areas named are: enhancing the detection performance of security screening systems; automating and integrating passenger security screening processes to make the process of boarding commercial passenger aircraft less painful than it is today; developing risk-based and intelligence-driven passenger and baggage screening technologies; developing flexible security solutions that enable TSA personnel to respond quickly and efficiently to emerging threats; applying science and technology breakthroughs to improve airport passenger security; and applying science and technology breakthroughs to improve intermodal transportation security.

Enhancing the detection performance of security screening systems involves improving how TSA officers characterize emerging threats; improving test and evaluation; and optimizing the performance of deployed security systems with emerging technologies.

Automating and integrating passenger security screening involves using enhanced technologies in risk-based and intelligence-driven screening; developing ways to adjust quickly to changing threats; making broad use of behavior-based targeting, screening, and analysis protocols and tools; and improving data processing and decision making.

Risk-based and intelligence-driven passenger and baggage screening technologies will involve standardized technology for airport and transportation security systems; making broader use of behavior-based detection capabilities; and enhancing trace detection systems.

Applying technology breakthroughs to airport security includes improving threat mitigation and response capabilities; and reducing false alarms in security equipment.

Applying science and technology breakthroughs to improve intermodal transportation security involves improving blast mitigation; improving behavior detection and biometric identification technologies; improving surveillance and anomaly detection; improving interoperable information systems; improving high-throughput threat detection; enhancing system resilience and recovery; improving remote disruption of attack capabilities; and improving freight tamper prevention and detection capabilities.

SIKORSKY CONTINUED FROM PAGE 4

about the cruise speed of small business jets.

The VTOL X-Plane program seeks to achieve its speed goals through cross-pollination between the fixed-wing and rotary-wing worlds to achieve radical improvements in VTOL flight, DARPA officials say.

Sikorsky and Aurora Flight Sciences engineers will design hybrid aircraft that will push VTOL limits in speed, hover efficiency, cruise efficiency, and useful load.

The VTOL X-Plane project is aiming at a top sustained flight speed of 300 to 400 knots; hover efficiency of at least 75 percent; cruise efficiency lift-to-drag ratio of at least 10; and useful load capacity of at least 40 percent of the vehicle's projected gross weight of 10,000 to 12,000 pounds.

The VTOL X-Plane program is scheduled for three phases over 52 months between October 2013 and February 2018, with the first demonstration flight set for spring 2017.

DARPA has allotted $47 million in Phase I, so more contracts could be awarded for preliminary concept design and technology maturation. Ultimately DARPA officials will downselect to one of the Phase I contractors to move forward with the second and third phases of the program.

The second phase of the DARPA VTOL X-Plane program will involve design, development, and integration, and the third phase will involve flight-test demonstrations.

FOR MORE INFORMATION contact **Sikorsky Aircraft** online at *www.sikorsky.com*, **Aurora Flight Sciences** at *www.aurora.aero*, and **DARPA** at *www.darpa.mil*.

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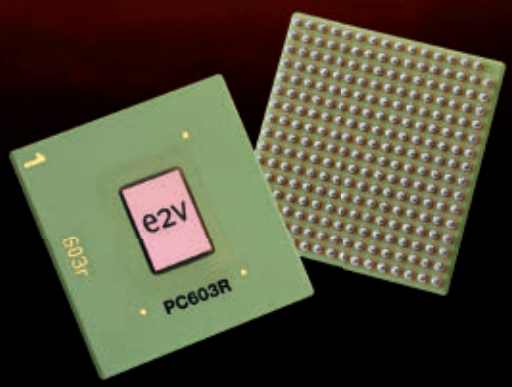

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Air Force launches spectrum warfare program covering EW, optical, GPS, and cyber warfare

BY JOHN KELLER

WRIGHT-PATTERSON AFB, Ohio—U.S. Air Force researchers are launching a research program to develop adaptive spectrum warfare technologies to enable U.S. and allied warfighters to control communications, radar, networking, and other crucial systems in the presence of electronic warfare and cyber warfare.

The U.S. Air Force is developing adaptive spectrum warfare technologies to control crucial systems in the presence of jamming and computer hacking.

The program, sponsored by the Air Force Research Laboratory at Wright-Patterson Air Force Base, Ohio, is called Advanced Novel Spectrum Warfare Environment Research (ANSWER), and seeks to develop adaptive spectrum warfare technologies to maintain warfighting capabilities in contested and denied environments consistent with anti-access/area denial (A2/AD) scenarios, Air Force researchers say. The ANSWER program previously was known as the Net-Enabled Electronic Warfare Technologies (NEWT) program.

With an ever-changing environment between red and blue forces, the ability to control the electromagnetic spectrum is a key requirement to achieving success in warfighter operations, researchers say. This is a daunting task under benign conditions and becomes even more of a challenge as adversaries bring more denial capabilities to bear.

The A2/AD scenario refers to the ability of U.S. and allied military forces to enter and operate efficiently in contested areas on land, at sea, and in the air. At the same time, A2/AD also refers to U.S. and allied military ability to deny then enemy to do the same.

A2/AD describes layered defense across several domains such as land, sea, air, cyber, and space. Weapons such as ultra-quiet diesel submarines, advanced mines, anti-ship weapons, and even cyber or anti-satellite weapons have the potential to slow, stop, or deter enemy combatants from entering a combat zone or contested geographic areas.

If U.S. and allied forces can conduct electromagnetic spectrum operations under A2/AD conditions, then they should be able to operate in other less challenging environments, researchers say.

To accomplish this, the warfighter needs to be able to control the enemy's use of the electromagnetic spectrum, ensure friendly access to and use of the electromagnetic spectrum, protect sensors and avionics, main-

tain secure communications and data links amid electronic and cyber warfare; and maintain navigation, and timing information.

The ANSWER program is designed to address these challenges. Among the program's thrusts are developing a reconfigurable threat-assessment simulation tool to help assess electronic attack techniques against modern radar tracking.

In today's RF spectrum battlefield, two types of threats to the warfighter exist: symmetrical and asymmetrical. Symmetrical threats are state-sponsored, and include conventional warfare elements such as networked air defenses. Asymmetrical threats involve individuals or groups that pose threats such as improvised explosive devices (IEDs), commercial cell phones and wireless networks, and computer hacking.

Air defenses can consist of ground-based, airborne, and maritime sensors and weapons. Electronic warfare capabilities are needed which can degrade and defeat the air defense capabilities by attacking the system as a whole, the individual components, and the links between those components.

Asymmetrical threats, meanwhile, post a more difficult problem because they are ever-evolving and technically advancing, use unconventional methods, are extremely varied, can stand alone or be connected, can be adaptive, and do not follow military protocol in design or use.

To help counter these threats, Air Force researchers are asking industry for unconventional thinking, to use advanced computing power, and incorporate state-of-the-art signal processing. The program also involves modeling and simulation to analyze and produce metrics to determine their effectiveness and the technical payoffs.

The ANSWER program also involves trusted, cyber-resilient avionics technologies that mitigate potential cyber vulnerabilities to aircraft avionics to keep U.S. technology protected from exploitation.

Other thrusts of the ANSWER program involve anti-tamper and software-protection technologies; GPS-like accuracies to the warfighter in A2/AD); alternatives to GPS; improved inertial systems; ionospheric effects on GPS technology; vision and laser-based navigation; advanced clock technology; and electro-optics countermeasures.

Extending usable life in the face of obsolescence

Operators and industry are joining forces to mitigate parts and component obsolescence issues in an effort to extend the service life of military vehicles.

BY **Courtney E. Howard**

The Royal Canadian Air Force actively employ the CF-18 Hornet fighter aircraft (at top), as well as invest in its continued maintenance, repair, and overhaul (above). (Images courtesy L-3 MAS and Royal Canadian Air Force, RCAF.)

"Every day, in industries all over the world, critical semiconductors become unavailable from the original manufacturer, even though there is a continuing need for them," says a representative at Rochester Electronics, an aftermarket semiconductor supplier in Newburyport, Mass. This fact is especially true in the aerospace and defense community, where engineers and executives actively wrestle with parts obsolescence issues.

In an era of increasingly tight budgets, government and military organizations are opting to keep aircraft, ground combat vehicles, ships, and even satellites and unmanned space rovers in service longer than originally intended rather than replace currently fielded vehicles with new platforms. As tight budgets drive the need to extend the service life of myriad vehicles—on the ground, at sea, and in air and space—aerospace and defense professionals in charge of fleet management are finding it difficult to source

Staff at L-3 MAS in Mirabel, Quebec, have helped to keep legacy military aircraft, including the Royal Canadian Air Force CF-18, flying for more than two decades. (Image courtesy L-3 MAS.)

original or replacement parts.

Compounding the problem, aging fleets were designed with custom-designed components rather than more readily available commercial off-the-shelf (COTS) parts. In short, acquiring the necessary parts and components to maintain aging fleets well past their intended useful life can be time consuming and costly.

Long service life

L-3 MAS, which provides aircraft support services to government departments and agencies as well as commercial customers, in Mirabel, Quebec, has provided CF-18 Hornet jet fighter-bomber fleet management and maintenance services for more than 25 years. Supporting the CF-18 military aircraft has been the company's "bread and butter" since 1986, explains Jacques Comtois, L-3 MAS vice president and general manager.

The CF-18 Hornet fighter aircraft, based on the McDonnell Douglas F/A-18 Hornet aircraft in the U.S., has been in service for more than 30 years with the Royal Canadian

Air Force (RCAF). The CF-18, first delivered to the Canadian Forces in 1982, has supported NORAD air sovereignty patrols and has flown in combat during the Gulf War in 1991, the Kosovo War in the late 1990s, and the international Libyan no-fly zone in 2011, officials say.

"Although hundreds of these F-18A and F-18B models were built, they are no longer being produced, so parts availability is an issue," Comtois says.

"It has required a lot of planning and preventative maintenance," Jean Roussel, P.Eng. M.A.Sc., vice president of engineering at L-3 MAS, says of the CF-18 aircraft. "Obsolescence management is something we have been doing for a long time. We are fortunate to have the engineering data for the CF-18, so we are able to follow the evolution of a part." This engineering data, acquired with the aircraft from Boeing is critical for CF-18 support, and has proven invaluable to L-3 MAS' efforts in keeping the CF-18 flying and readily available to the RCAF for myriad missions.

Lifecycle costs

A general rule of thumb is that two thirds of an aircraft's life cycle cost occurs after the acquisition during the operation phase; that is, an operator will spend two times the initial acquisition cost of an aircraft on maintenance, repair, and overhaul (MRO) activities to keep that platform running and extending its usable life. "If you buy a fleet of aircraft for $9 billion, for example, you'll likely spend over $18 billion during its lifetime," explains Comtois.

For this and other reasons, aerospace and defense executives recommend including product lifecycle management (PLM) and parts obsolescence measures in negotiations prior to signing a contract for new aircraft, service plans, and the like. Procurement personnel should ensure the availability of an uninterrupted, safe supply of parts to support in-field MRO services.

Effective supply-chain management is, likewise, encouraged to ensure a continuous supply of essential and authentic parts and components. Dwindling supplies of legacy and even obsolete parts have prompted companies to open up their supply chains to new and sometimes unproven providers and, in doing so, they run the risk of introducing counterfeit parts into their portfolio.

For more on parts obsolescence challenges affecting the aerospace and defense community, please read "Counterfeit component chaos" on page 10 of the December 2013 issue of the *Military & Aerospace Electronics* print magazine or online at http://ow.ly/rVBfZ.

Industry consultants recommend asking distributors for traceability information, evidence that links a part back to the original equipment manufacturer (OEM), when introducing a new distributor to the supply chain. In the absence of such documentation, testing can help to ensure a part's authenticity.

The safest option is purchasing directly from OEMs or OEM-authorized distributors, which hold the exclusive rights from an OEM to market, store, and ship its products.

A close second comes by way of manufacturers that have licensed an OEM's intellectual property to provide a continuous supply of qualified, certified components. When neither a legacy component nor the associated IP are available, companies can often deliver replicated parts or replication services.

The CF-18 Hornet military fighter aircraft is based on the F/A-18 Hornet in the U.S. (Image courtesy RCAF.)

Semiconductor manufacturer Rochester Electronics, for example, specializes in continuing the manufacture of end-of-life and mature semiconductors and re-creating much-needed semiconductors with limited or no IP, to "turn end-of-life problems into extension-of-life solutions that provide you with the authorized, guaranteed components you need for as long as you need them," company officials say.

In the end, it is advisable to partner with companies—including component and systems suppliers and fleet-management and MRO service providers—with a track record of delivering authentic, legacy components and quality services.

Life extension

Various countries are coming to L-3 MAS to help extend the life of their aircraft fleets while they are waiting for JSF, Comtois explains. In fact, L-3 MAS engineers are working with U.S. Navy personnel to extend the life of the Navy and Marine Corps fleet of F/A-18 strike fighters.

"The U.S. Navy is looking to keep

their legacy F/A-18 in service for as long as 2030, although they were expected to be out of service by now," Comtois notes. Canadian officials take a different approach to military platforms, including a prepared plan to extend the life of an aircraft fleet and an expectation to keep platforms in service for at least three decades. "Canada decided from the beginning to have a long service life" for the CF-18, he says.

Canadian government officials in July 2010 announced plans to replace the CF-18 with the Lockheed Martin F-35 Lightning II Joint Strike Fighter (JSF). Canadian military leaders had planned to buy 65 F-35s with deliveries starting in 2017; yet, the government is now reconsidering its options for a new fighter aircraft. As a result, the CF-18 fleet will need to remain in service for many years to come.

Boeing leaders in the U.S. are recommending that Canadian and other government customers consider an advanced version of the F/A-18 Super Hornet as a less

The Canadian Forces has been flying the CF-18 since the 1980s. (Image courtesy RCAF.)

expensive alternative to the F-35.

In September 2013, Boeing officials reportedly provided the Canadian government with cost and capability data illustrating that a fleet of 65 of its F/A-18 Super Hornet fighter-attack jets would cost roughly $1.7 billion less than a comparable Lockheed Martin F-35 stealth fighter order.

Midlife upgrades

Delays in the JSF program have prompted so-called "midlife upgrade" activities across the globe—a trend which presents parts obsolescence challenges and drives the need for obsolescence-mitigation techniques.

Militaries are opting to retrofit currently fielded aircraft, including the F/A-18, due to JSF program delays and reduced military budgets. Both of these causes have prompted U.S. Navy officials to upgrade and extend the useful life of F/A-18 Super Hornets.

U.S. Department of Defense (DOD) leaders last month revealed roughly $873 million in contract awards to Boeing for system upgrades to F/A-18 fighter planes, including A/B, C/D, E/F, and EA-18G electronic attack plane variants for the U.S. Navy and allied governments. The indefinite-delivery/indefinite-quantity contracts cover work through December 2018 and a range of upgrades for the U.S. Navy and the governments of Australia, Finland, Switzerland, Kuwait, Malaysia, and Canada.

Government officials in Australia upgraded 71 F/A-18A and F/A-18B aircraft to extend their service lives to 2015, at which point they were to be retired and replaced with the F-35 Lightning II. Many of Australia's Hornets have required additional retrofits to extend service life through the new F/A-18 planned retirement date of 2020.

Finland officials are applying a midlife upgrade with new avionics, including new cockpit displays, sensors, and data links, to their fleet of F/A-18s, which will be expected to remain in active service until at least 2030.

Projecting production lines

Perhaps the most obvious and preferred method of obsolescence mitigation is to keep OEM production lines open. This is the aim of Boeing officials and industry supporters when it comes to the F/A-18 Super Hornet variants.

U.S. Rep. J. Randy Forbes, R-Va., chairman of the House Armed Services subcommittee on seapower and projection forces, last month issued a letter to U.S. Secretary of Defense Chuck Hagel expressing concern with current U.S. Navy plans that would see the F/A-18 production line close this decade.

"Should the Navy choose to allow the F/A-18 production line to close, the U.S. will be left with only one manufacturing line capable of producing combat-ready tactical aircraft until later this decade," Forbes wrote. "The risk to U.S. national security and the health of our aviation industrial base of relying on only one tactical aircraft supply line is simply too great to allow the line to close. I urge Secretary Hagel to carefully weigh the effects of any such closure on the U.S. defense industrial base and the future of our carrier air wing.

"Today, American forces find themselves increasingly challenged by mature precision-strike regimes that will require an Air Wing possessing a combination of extended range, persistence, stealth, payload, and electronic warfare capabilities and operating at both the high and low-end of the cost-curve," Forbes continued. "However, the fiscal year 2014 President's Budget request indicates the Navy's intention to end the production of its only manufacturing line capable of producing U.S. combat ready tactical aircraft and the only airborne electronic attack aircraft for the Nation. The F/A-18 E/F Super Hornet and EA-18G Growler offer the Navy a variety of the capabilities I have described above. With future carrier-based aircraft still in development until 2019, I strongly believe that creating a single U.S. tactical aircraft supply chain at this time is too great a risk."

The CF-18 is a twin-engine, multi-mission, tactical aircraft. (Image courtesy RCAF.)

Preemptive upgrade

Some industry leaders are opting to nip obsolescence issues in the bud by proactively upgrading systems

with an eye toward future parts availability. U.S. Air Force avionics experts are working with Lockheed Martin Corp. engineers to upgrade embedded computers in primary flight displays on the C-130J Super Hercules utility turboprop aircraft not only to improve capability, but also to stave-off component obsolescence.

The Lockheed Martin Aeronautics segment in Marietta, Ga., won a $21.6 million contract from the Air Force Life Cycle Management Center at Wright-Patterson Air Force Base, Ohio, to deliver a diminishing manufacturing sources solution for color multifunctional display units (CMDUs) and multifunction control units (MFCUs) aboard the C-130J aircraft. The contract modification redesign effort for the CMDU and MFCD is to replace the display's obsolete common central processor and graphics processor chip sets.

The CMDU, manufactured originally by L-3 Display Systems in Alpharetta, Ga., is a 10.4-inch viewable active-matrix liquid crystal display (AMLCD)-based smart display with embedded processing and graphics processing. Five CMDUs serve as primary flight displays providing situational awareness for the flight crews aboard the C-130J. The CMDU is a sunlight-readable display that is night vision-compatible and boasts a high-resolution XGA with 60-degree viewing angle.

Rugged computers proliferate through military applications

Onboard computing for the military is increasingly common and crucial for military weapons, vehicles, and sensors, which is driving requirements for their ability to withstand the combat environment.

BY **J.R. Wilson**

In the old days (the 1980s and 1990s), rugged battlefield computing largely meant ensuring a command post's rack-mounted command and control (C2) system could withstand temperature extremes and the shock and vibration of a nearby explosion.

Onboard computing, however, has become increasingly common and crucial on more and more weapons systems, vehicles, field sensors, and related platforms. The ability for rugged computers to withstand the combat environment is growing in importance, as well.

Today, the ruggedization requirement ranges from even more complex rack-mount command post and vehicle computers—and a mission expanded to command, control, communications, computers, intelligence, surveillance and reconnaissance (C4ISR)—to devices carried by individual warfighters or small units.

"There are two real realms in what we do—designed to be rugged from the start and ruggedizing commercial technology," says David Jedynak, chief technology officer at Curtiss Wright Controls Defense Solutions in Ashburn, Va. "You aren't really starting with a clean sheet, but taking what is generally commercially available and making sure the board we are making is designed for this use right from the start. You start with component technologies—processors, memory, PCB [printed circuit board] designs—usually what you see in the industrial world, but then build in native design concepts that allow you to be efficiently rugged. That can include how a PCB flexes to laying out a board for the most effective cooling or more exotic things, such as significantly higher power requiring the use of techniques such as liquid flow."

Rugged computers are seeing increasing use by front-line warfighters, which puts a premium on durability, size, weight, and power.

Data security

The ubiquitous and critical nature of battlefield computing means the requirement to ruggedize such systems against everything from extreme temperatures and humidity levels, fine sand, saltwater, shock, vibration, radiation, and electromagnetic pulse (EMP). To complicate matters, today's requirements include ever-higher levels of security. The latter includes both on-board data and data flow, whether wired or wireless.

"Going back 20 years, looking at commercial versus military architectures, the difference typically is ruggedization, equipment that can handle both temperature and other environmental extremes without degradation in performance," says Michael Coon, a field applications engineer at TE Connectivity Global Aerospace, Defense & Marine (GADM) in Harrisburg, Pa. "As we migrate toward the Future Soldier, that period takes us from a compass and walkie-talkie to today's soldier having GPS, a satphone, an onboard computer that does live video feeds through his helmet display, a drop-down key bag giving him access to maps, terrain, troop locations, etc.

"You're seeing an evolution not only in the amount of data that needs to be transferred, but also the type of data, an evolution along the lines of ruggedized wireless, fiber optics, and high-speed interconnects," Coon says. "That also means miniaturization in rugged, lightweight systems with higher and higher bandwidth channels. So we're taking very large, militarized, ruggedized connectors and shrinking them while also allowing faster and faster bandwidths. Traditional filtering that was on the board now has to be lighter, handle faster speeds, and

be more complex. Ruggedization is the big key."

The U.S. military has seen the networked battlespace evolve more quickly than originally envisioned to meet the needs of more than a decade of combat in extremely harsh environments. The result has been a complex merging of requirements for rapid fielding, SWaP [size, weight, and power consumption] enhancement, faster-smaller-lighter-cheaper, ruggedization, high bandwidth, mobility, interoperability (including backward to legacy devices) and enhanced security at the software, hardware, and frequency levels.

All those requirements have been further complicated in recent years by downsizing, budget cuts (often forcing continued use of legacy equipment beyond its intended life cycle), the Pacific pivot (with a greater emphasis on Navy/Marine Corps capabilities), an entirely different set of environmental threats, and more technologically capable potential adversaries. In the end, however, no one of those is significantly more critical than the others.

Without security, no level of ruggedization provides a combat edge—and vice versa. SWaP, bandwidth, mobility, cost, speed-to-field, and other considerations all must be built into new systems from the original blank sheet of paper. To the extent possible, especially given the extended use of legacy systems, that also is true with upgrades, albeit more difficult to accomplish.

COTS components

Ruggedization and security also are affected by the military's growing dependence on commercial off-the-shelf (COTS) components since the 1980s and, more recently, the use of open architecture in new designs.

"There are two things driving that—cost and technology. The latter is not only performance, but compatibility," says Gregory Powers, business development manager at TE GADM. "DOD [the U.S. Department of Defense], globally, has pretty much stepped back from a lot of rugged computing standards. So COTS configuration and control is assured through a number of civil and commercial organizations."

As to concerns that adversaries also have access to COTS components and systems and might twist open architectures to their own purposes, Curtiss-Wright's Jedynak says those are over-simplified and largely irrelevant. "Terrorists can buy components on the open market and build things, but typically those are out-of-date items that are not supported. If you buy an off-the-shelf cellphone to remotely detonate a car bomb, that can't be scaled up and maintained long term. And their adversaries—meaning us—can easily understand the technologies they are using and how to defeat them," he says. "At the same time, we ensure the commercial technologies we use are well-supported and designed, available for a very long time and any vulnerabilities an adversary could exploit are identified and protected.

"With MIL-COTS, we get all the benefits of open standards and industrial competition, but also assurance that what is being bought is protected, in some cases through ITAR or various classification levels. So the overall posture is more guarded, more sustainable in the long-run," Jedynak adds. "That level of support, quality, performance, and

attention to detail ultimately will triumph over the short-term use of truly off-the-shelf equipment you can get at a local retail store."

SWaP

Regardless of how and where battlespace computing is employed, how well it meets combat requirements also depends greatly on the platforms in which it is installed and other proximate or potentially interfering equipment and technologies. Those often involve methods of construction or other alternatives designed to address their own SWaP, acquisition/lifecycle maintenance costs, and other requirements, with non-platform critical computing considerations coming late in the process.

"For example, we've seen a migration away from traditional aluminum or other metal aircraft into composites. The more composites you have, the more that aircraft is susceptible to lightning or surge strikes going into the equipment rather than being absorbed by a metal aircraft's large mass surface area," Coon says. "So we look at existing equipment and incorporate ways to help remove or compress that transient strike in a composite aircraft without the contractor having to relayout their boards.

"We're also seeing more and more portable, ruggedized network architecture—switches and routers. So on today's battlefield, you have to ruggedize the network connectors and I/Os to handle the level of data coming from individual soldiers or equipment into the C2 center," Coon continues. "That may be a wired, wireless, or fiber-optic architecture. We're also looking at more and more applications where, rather than a traditional connector with [a few] fiber-optic contacts, they may have 24 or 48 fiber-optic interconnects within the same size, making that trunk larger to handle all the information."

Another significant change in recent years has been the growing use and diversity of combat robotics and with that, requirements for more portable, ruggedized lightweight controllers. Coon predicts a significant increase in that area as future weapons evolve, including ruggedized robotic equipment carriers and field transports, some with weapons for

sentry support.

As combat equipment at all levels becomes more technology enhanced and interdependent, more bandwidth will be required to manage it, creating yet another cycle of environmental needs versus security and SWaP. Depending on their products and customer requirements, contractors involved with rugged and secure military computing, especially within the battlespace, have different views of and approaches to COTS and even open architecture.

COTS and open systems

Mercury Systems in Chelmsford, Mass., has expanded—largely through acquisitions—from providing specific electronics for battlefield applications, such as embedded fabrics for radar systems, to address the full span of battlefield sensor electronics at component, module, subsystem, and integrated levels. Those range from high-performance IR and acoustic sensors to rugged storage solutions.

Meeting the military's toughest needs with straight COTS is rarely part of the equation, points out Darryl McKenney, Mercury Systems engineering services vice president. "We don't believe COTS has truly existed in terms of being sold into machines for the primes. We instead refer to it as 'custom-off-the-shelf'—commercial items close to, but not exactly, meeting needs for military temperatures, ruggedization, and security. That goes into our methods to satisfy customer needs. When you look at VITA-47, most of the specs we are designing to meet have a direct link to some of the original MILSPECs.

"With regard to open architecture, for cards to have slot profiles and plug-and-play together has significantly reduced some of the plug-and-pray phenomena we had to deal with for several years," McKenney says. "It's a much larger challenge to our engineering organizations."

McKenney points to the temperature ranges for which commercial computers are built versus the military's need to use them at more extreme levels as an example of MCOTS, which can include developing or eliminating high-performance connectors, which are reliability concerns. "We develop technologies allowing us to run custom-printed circuit boards, connectors, software, hardware, cooling mechanisms in extreme environments and temperatures where conventional computers won't work. So we've had to improve subsystems almost from beginning to end.

The B300 ultra rugged notebook computer from Getac is tough enough for military field use.

"When you look at our deployable radar systems for ground-based applications, we've had to help develop rugged connectors for VPX to help solve long-term reliability index issues for extended deployment," McKenney says. "Some of the original VME-based radar systems in the 1960s, for example, might get to 80 watts per slot; the latest system we deployed approaches 200 watts per VPX slot." However, he adds, such changes cannot be developed and deployed in a vacuum.

"We very much believe in standardization to leverage innovation. For example, we helped develop VITA 62 [Open VPX-compliant] power supplies, using open standards on the power supply format and configurations. That same 1000-watt power supply has been engineered for about a dozen platforms, which a few years ago would have had custom power supplies for each," McKenney says. "We now have 6U VPX cards that can be used in airborne applications, from small to wide-body, ground mobile or ground radar or fixed installations. Leveraging the same card across many different mission platforms, using different software, really helps drive the affordability index."

Continuing evolution

As to the future, McKenney sees a continuing evolution of technologies to meet changing battlespace conditions and requirements.

"As companies such as Intel make faster and faster silicon, that is driving newer innovations in how we will compute, distribute, and handle the volume of computational data we can now generate. Some of the newer breakthroughs, as we generate 10, 50, 100 times more data and

translate it into usable information, will be among the huge paradigm shifts we will see in coming decades.

At the same time, McKenney notes, simultaneously merging ever-growing requirements for rugged and secure computing with an equally pressing demand to free battlefield devices from physical connectivity is probably our largest single challenge moving forward. "Those are opposing, intense, polar situations. We're being asked to ratchet down and control where information goes, who gets to see it, what it looks like—yet make it available to a wide audience. Those conditions do create opportunities for innovation, where more COTS will be deployed in the next five years to allow people to transport data at speeds, using bisectional bandwidth, and in secure capacities like we've never had.

"I look at combat computing not only as rugged, but as smart. As I look across our sensor chain and the ability to communicate from legacy to new equipment and crossing many different old and new platforms, smart becomes an important paradigm because you are seeing lots of platform integration upgrades needing smart electronics for a smarter battlefield," McKenney says.

Networked battlespace

Curtiss-Wright's Jedynak agrees in principal, but has a slightly different take on meeting all the demands of a networked battlespace without the solutions working against each other.

"Security, SwaP, and rugged, we don't think, really pull us in opposite directions. When you optimize SWaP, smaller sizes, for the most part, mean fewer problems with vibration and shock, which is a benefit. As you become more efficient in your computing resources—bits per watt, for example—your cooling requirements start to drop to achieve the same level of performance. So you can cut back on mass, which further improves SWaP optimization," Jedynak says.

"If we can continue following along with Moore's Law, driving electronics to ever-smaller sizes, it makes dealing with environmental

COMPANY INFO

AAEON
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ACCES I/O Products
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ADLINK Technology
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Aitech Defense Systems Inc.
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ALPHI Technology
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American Portwell Technology Inc.
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Sealevel Systems
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SIE Computing Solutions
sie-cs.com
Stealth Computer
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Trenton Systems
trentonsystems.com
VadaTech
vadatech.com
VT Miltope Inc.
miltope.com
WIN Enterprises
win-ent.com
Xplore Technologies
xploretech.com
Z Microsystems
zmicro.com

issues somewhat easier, with less external surface to protect," Jedynak says. "If you reduce size without reducing power, you can have some cooling problems, but if you take the same level of performance and shrink it, with half the power requirement, it helps shrink the box."

As the U.S. military continues its drawdown in Afghanistan and prepares to give more attention to Africa, with its scarcity of infrastructure, and the long distances that mark the Asia/Pacific, most involved with designing future systems to meet evolving military requirements agree on certain key predictions:

- wireless communications will continue to proliferate;
- the use of commercially developed technologies and devices will grow even more;
- in high-end computing, VPX for defense also will continue to proliferate; and
- cost—maintenance, repair, incremental upgrades—will be a prime driver for mission- and life-critical systems.

"Incremental evolution, from C2 computers to handhelds, will be based on commercial developments. In many places, the commercial world is a few years ahead of the military," says Powers. "Some people say optics eventually will replace copper, given its advantages in speed and distance and the ability to deploy in areas previously not thought possible."

"Changing budgets will really drive us, in a good way, to push the technologies, understanding what is good enough, best value, highest performance and the various shades in that spectrum, and how to get better synergies," Jedynak says. "That is the overriding theme."

Infrared sensors blending with signal processing to yield new levels of surveillance

BY **John Keller**

There was a time when infrared sensors provided contrast between warm and cold objects, and essentially not much more. These long-wave infrared sensors, also called heat seekers, yielded images that detected warm objects over relatively cool backgrounds.

This approach continues to this day in aerospace and defense intelligence, surveillance, and reconnaissance (ISR) applications to detect and classify humans and animals from the warmth of their skin, as well as land vehicles, aircraft, and industrial sites from their hot engine exhaust.

Still, infrared sensing is becoming far more sophisticated today than simply detecting warm objects. Medium-wave and short-wave infrared sensors are revealing other segments of the light spectrum to enable imaging subtle detail in shadow, the ability to see through windows, and even differentiate between different kinds of foliage—all in low-light or no-light conditions detectable to the naked eye.

Beyond these advances, new and emerging levels of optical sensitivity and optical throughput are making high-resolution infrared sensors not only smaller and more lightweight, but also less expensive.

Smaller size makes infrared sensors more broadly applicable to new classes of small unmanned aerial vehicles (UAVs) on which every gram of extra weight counts.

Decreasing costs for sophisticated infrared sensors also makes this technology accessible to a growing number of systems integrators and applications, who can find innovative new uses.

Not only are enhanced individual sensors proving to be a boon to the ISR community, but their potential to combine the signals from several different infrared sensors also is coming to bear on

The Micro-Hyperspec sensor for short-wave infrared (SWIR) from Headwall Photonics features a 900-to-2,500-nanometer spectral range.

COMPANY INFO

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http://www.baesystems.com/Businesses/ElectronicSolutions/index.htm

DRS Technologies RSTA
Palm Bay, Fla.
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http://www.drs.com/Products/RSTA/index.aspx

FLIR Systems Inc.
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Lockheed Martin Missiles and Fire Control
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ITT Night Vision and Imaging
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ITT's Geospatial Systems
Rochester, N.Y.
585-269-5600
http://www.ssd.itt.com/

Kollsman, an Elbit Systems of America company
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603-886-2080
http://www.kollsman.com/index.asp

L-3 Infrared Products
Dallas
972-528-1300
http://www.l-3com.com/divisions/overview.aspx?id=39

Premier Electronics Ltd
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01992 478321
http://www.premierelect.co.uk

Princeton Lightwave
Cranbury, N.J.
609-495-2600
http://www.princetonlightwave.com/index.htm

Raytheon Vision Systems (RVS)
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805-562-4292
http://www.raytheon.com/businesses/ncs/rvs/index.html

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the industry. Multispectral and hyperspectral sensors also are decreasing in size, weight, and cost to increase the availability of these technologies.

Perhaps the most exciting new development on the horizon for infrared sensors, however, is integrating sophisticated digital signal processing, computer databases, and infrared sensor data to identify detailed and specific infrared signatures such that surveillance and intelligence experts can identify not only narrow classes of targets, but also individual targets.

Think of the way sonar experts operate aboard Navy attack submarines. Each submarine listens constantly with several kinds of sonar arrays, which are able not only to detect enemy submarines and surface vessels at very great distances, but also to listen for specific sound signatures.

In this way attack submarine crews with high levels of certainty can identify separate classes of submarines, and sometimes even the specific submarine hull number by matching details of the detected sound signatures to a large and growing database of known submarine sound signatures.

Now apply that same principle to infrared sensors. As sensor sensitivity, resolution, and signal processing advances, surveillance experts can start compiling databases of known infrared signatures and matching those with detected targets.

The result will be not only the ability to detect idling vehicles or snipers hidden in trees, but also the ability to detect disturbed dirt that might indicate the presence of a hidden improvised explosive device (IED), the ability to detect and classify explosive agents in real time, the presence of chemical and nerve agents in the air, and many other applications.

Infrared surveillance systems are matching libraries of infrared signatures to detected targets today, and the sophistication of this approach is improving over time.

"There are established libraries of optical signatures to detect a signature of a material they are looking for, and that they know of," explains David Bannon, CEO of optical sensing specialist Headwall Photonics Inc. in Fitchburg, Mass.

"They can fly over with a UAV sensor, see a priority signature, and send it as a positive hit via data link to the ground for further processing," Bannon describes. "When the UAV lands, they pull the data drive and do post-mission processing, and that is how they build their signature libraries." ←

OPINION

A three-tier business model to benefit the global semiconductor industry

BY **Apek Mulay**

It is an open secret that, for a variety of reasons, the U.S. manufacturing base has sharply deteriorated over the past three decades, and the semiconductor industry is no exception. In fact, this industry may have suffered harder than some other enterprises. The purpose of this paper is to explain the causes of this decline and offer some common-sense economic policies that may lead to the industry's revival.

In the microelectronics area, a semiconductor fabrication plant is a factory where such devices as integrated circuits are manufactured. A business that operates a semiconductor fab for the purpose of fabricating the designs of other companies, such as fabless semiconductor companies, is known as a foundry. If a foundry does not produce its own designs, it is known as a pure-play foundry. As of today, the semiconductor industry follows a multinational corporation (MNC) business model based on globalization.

Following World War II, U.S. business leaders pursued globalization, believing that American firms would be able to capture foreign markets, but the opposite happened. Other nations imported technology from American companies, and, with their low real wages, out-competed U.S. firms all over the world. The rest is history.

When the recession struck in 2007, the lingering weakness of the American economy came to the surface. With decreased exports and increased imports and the high cost of maintaining U.S. war fronts abroad, the budget deficit has been increasing. Additionally, counterfeit electronics from abroad have raised national security issues.

Multinational corporations have spread their semiconductor production operations across the globe, and since the 2007 recession, the semiconductor industry has observed flat growth in its revenue and many small businesses have experienced a slowdown.

My proposed business model is designed to help restore a balanced economy without having to rely on overseas investment or foreign debt; establish a free-market economy where supply and demand of goods rise and fall automatically with minimal government intervention; solve the problem of unemployment and, hence, excessive government spending that leads to budget deficits; help the semiconductor business be at the leading edge of technology through sustainable capital investments; and ensure a competitive business environment which would stimulate the growth of small businesses.

A balanced economy is critical to take the global semiconductor industry to the next level of innovation and financial success because it would increase domestic consumer purchasing power. In addition to a balanced economy we also need a decentralized supply chain, which increases co-operation among businesses, decreases wealth concentration in the economy, and improves efficiency and customer satisfaction.

Macroeconomic reforms towards decentralizing the fabless semiconductor business would boost the growth of several small fabless firms in an economic subsystem. Only with a decentralized supply chain does can an individual player flourish. Hence, the decentralized supply chain leads to smaller organizations and a lower probability for mergers and acquisitions. A decentralized supply chain leads to higher co-operation among entities in an industry.

A three-tier model

I propose a three tier model for the robust growth of fabless semi-

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conductors. The entire semiconductor industry should be split into economic subsystems based on the availability of raw materials. This model is based on what is known as progressive utilization theory or PROUT, which was put forth by Shri Prabhat Ranjan Sarkar in 1959.

The upper tier is a top notch wafer fab and fabless small businesses are a lower tier. The middle and most important tier has neo-cooperative corporations that have exchange relationships in a decentralized supply chain. The middle industrial tier connects the other two industrial tiers with rest of the economy.

A wafer fab needs an investment larger than that of a nuclear reactor. In 2013 the cost of building the next generation wafer fab was estimated at over $10 billion. The location of wafer fab should have ready availability of all necessary raw materials, as well as access to airports and transportation infrastructure for a smooth delivery of the goods to end customers. This would ensure the growth of smaller and medium size businesses, which would cater to that fab. Any infrastructure investment would be a long term investment to attract other businesses.

To have a balanced economy, the official monetary policy should be such that wages keep up with labor productivity. Since workers' wages contribute to consumer demand and workers' productivity contributes to the supply of goods, when wages catch up with productivity, supply and demand grow and fall together. To ensure that wages catch up with productivity, there should be special incentives offered to highly productive employees. The remaining profits, if any, should be shared with the private investors as return on their investments. Fabs should have complete autonomy to lay off unproductive employees to stay at the forefront of innovation.

For the semiconductor industry to be financially successful, it is critical that money circulates in the economy. To make this feasible, the fab should offer retirement schemes to enable its employees to invest some of their income toward the growth of their company by purchasing company shares.

This model has two benefits. Since employees own some shares of the fab, they would work hard towards the success of the foundry. In economic downturns, these wafer fabs would prefer to share losses by taking across-the-board wage cuts or by cutting work hours of workers rather than laying them off. A good wafer fab also should collaborate with local universities by offering co-operative internships to engineering students and technicians.

"To have a balanced economy, the official monetary policy should be such that wages keep up with labor productivity."

Lower tier

An established wafer fab also would create local businesses, which provide necessary tools, test equipment, and engineering services. These providers would form Lower Tier of this three-tier business model.

The fabless industry should decentralize how it offers these engineering services. Small business units (SBUs) should offer engineering services such as circuit design engineering, circuit layout engineering, test development engineering, failure analysis, tool manufacturing, and maintenance.

Each engineering service provider should work as an independent SBU with a maximum of 30-50 employees in each business unit. These SBUs should comply with anti-trust laws, and avoid mergers and acquisitions, which restrict competition. To avoid monopoly capitalism in the semiconductor industry, the existing shares of all major corporations should be given to employees in proportion to their productive contributions.

The next step should be to decentralize the fabless companies and make each individual business unit function independently. This means the design engineering team would become an independent business; so would the product engineering team, customer quality engineering, reliability engineering and so on. The respective businesses would operate at either lower tier or middle tier depending on their operation.

The integrated device manufacturers (IDMs) that now are privately owned also should split their fab and fabless businesses. The old fabs could function as tier 1 wafer fabs

for analog chips which do not need cutting-edge transistor technology and the fabless businesses in these IDMs could be split into independent businesses to join either the middle tier or the lower tier.

Similarly, large tool manufacturing corporations should divide into SBUs and operate as independent small businesses. The wafer fab should give equal opportunities to all SBUs to compete for business, which would encourage new entrepreneurs to start their own businesses. The middle tier of the three-tier model should act as a medium to offer these services to wafer fab and also should act as the most important sector, which links the end customer (or user of electronic products and services) to upper and lower tiers of the semiconductor industry.

All engineering departments involved at the pre-silicon and post-silicon stages should have a healthy competition with one another. This would enable the end customer to get products manufactured at significantly lower costs. Such a decentralization of the fabless business would provide most innovative designs of new products.

Middle tier

The middle tier should include semiconductor businesses that work directly with end customers. This sector should include corporations with a maximum of 500 employees. This sector would interface directly with end customers, as well as with the upper business tier and the lower business tier. It would consist of co-operatively managed semiconductor companies, where the majority of company assets are owned by company employees. All corporations in this tier should have exchange relationships as a decentralized supply chain.

The sales and marketing division would be able to get feedback on the demands from local customers and draft customer specifications to manufacture customized electronic gadgets based on the needs of the domestic economy. This middle tier team also would interface with lower tier SBUs, e.g. design engineering to develop customized electronic products.

Chip packaging and assembly would be done in this tier, which would cooperate voluntarily with other corporations in the middle. However, those corporations that follow the model of employee sponsored corporations should be given tax incentives to attract the other players in the middle tier to follow the model of employee owned corporations. Majority shares of mid-size corporations in the middle tier would be owned by employees for them to have a stake in the success of their business.

There are many advantages of having the middle tier in the semiconductor industry. If neo-cooperative corporations in this sector notice that customer demand is falling, then they would be able to communicate with the wafer fab at upper tier and the fabless business unit at lower tier to avoid overproduction of silicon. The upper and lower tier could use economic downturns either to cut work hours or concentrate on research and development.

With this middle tier, the neo-cooperative corporations would be able to adjust the supply and demand of electronics with a co-operative action of producers and consumers. Additionally, the middle tier would estimate consumer demand.

Another advantage of this three-tier business model would be parallel processing. The middle level could negotiate a good price for pre-silicon and post silicon services and get the work started simultaneously with shorter life cycles. This would reduce manufacturing cycle time and manufacturing costs. When economy grows, the wages of all employees also would grow. When the economy slows down, the corporations would reduce work hours across the board to avoid job cuts due to layoffs.

This three-tier business model for global Semiconductor industry would wholeheartedly accept automation in the industrial sector. Due to the use of new machines labor productivity would grow exponentially. In such a scenario the co-operative sector would be able to meet the required production target with fewer work hours but pay its workforce a higher salary in proportion to their higher productivity resulting from the use of machines.

This business model would make contributions to completely automate production of semiconductor chips from the beginning to the end which is often referred to as lights-out fab. Such a business model not only would lead the fabless semiconductor industry to the next level of innovation and financial success, but also would act as a model for other sectors in the economy leading to a vibrant growth of regional and national economies. ←

Navy buys Insitu RQ-21A Blackjack UAV while ramping-up production

U.S. Navy officials are buying one new tactical unmanned aerial vehicle (UAV), intended as an organic and dedicated multi-intelligence UAV for U.S. Marine Corps and Navy tactical commanders, in preparation for ramping-up production of the front-line tactical unmanned aircraft. Officials of the Naval Air Systems Command at Patuxent River Naval Air Station, Md., awarded an $8.8 million contract to Boeing Insitu Inc. in Bingen, Wash., for one RQ-21A Blackjack UAV, to include air vehicles, ground control stations, launch and recovery equipment, and air vehicle support equipment. The Boeing Insitu RQ-21 is a twin-boom, single-engine, monoplane UAV for surveillance and reconnaissance.

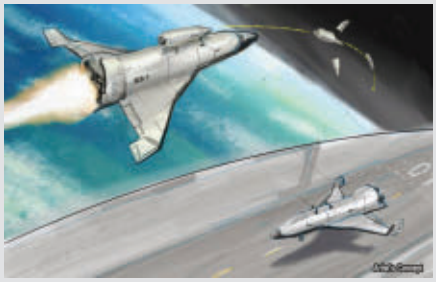
Northrop to operate man-hunting airborne radar system in Afghanistan

Airborne radar experts at the Northrop Grumman Corp. Electronic Systems segment in Linthicum, Md., will continue to operate and support a system designed to detect and follow people on foot and moving land vehicles under terms of a $65.3 million contract modification. Northrop Grumman will do the work on the U.S. Army's Vehicle and Dismount Exploitation Radar (VADER) system.

DARPA to develop unmanned hypersonic space plane for deploying satellites

BY **John Keller**

ARLINGTON, Va.—U.S. military researchers are asking industry to begin work on developing a reusable hypersonic unmanned spacecraft able to carry and deploy 3,000-to-5,000-pound satellites to low-Earth orbit (LEO) for less than $5 million per launch.



This artist's rendering depicts a future reusable hypersonic unmanned spacecraft able to deploy satellites to low-Earth orbit.

Officials of the U.S. Defense Advanced Research Projects Agency (DARPA) in Arlington, Va., have released a formal solicitation (DARPA-BAA-14-01) for the initial phase of the XS-1 Experimental Spaceplane project to design a reusable spacecraft to support not only next-generation launch for government and commercial satellites, but also global-reach hypersonic and space-access aircraft.

The XS-1 program seeks to lower satellite launch costs by developing a reusable hypersonic unmanned vehicle with costs, operation, and reliability similar to traditional aircraft, DARPA officials say.

The vehicle is envisioned to operate from a clean pad, with a small ground crew, and inexpensive infrastructure to enable routine daily operations and flights from a wide range of locations. XS-1 seeks to deploy small satellites faster and more affordably than is possible today, while demonstrating technology for next-generation space and hypersonic flight for government and commercial users.

"We want to build off of proven technologies to create a reliable, cost-effective space delivery system with one-day turnaround," says Jess Sponable, who is heading the XS-1 program at DARPA. "How it's configured, how it gets up, and how it gets back are pretty much all on the table."

XS-1 envisions that a reusable first stage would fly to hypersonic speeds at a suborbital altitude, when one or more expendable upper stages would separate and deploy a satellite into low-Earth orbit.

The reusable hypersonic aircraft then would return to Earth, land, and be prepared for the next flight. Key XS-1 technical goals include flying 10 times in 10 days, achieving speeds faster than Mach 10 (7,600 miles per hour) at least once and launching a payload to orbit. The program also seeks to reduce the cost of access to space for small payloads by at least a factor of 10, to less than $5 million per flight.

XS-1 would complement the DARPA Airborne Launch Assist Space Access (ALASA) program, which already is researching satellite

DARPA CONTINUED FROM PAGE 28

launch systems that aim to be fast, more convenient, and affordable. ALASA seeks to propel 100-pound satellites into orbit for less than $1 million per launch using low-cost, expendable upper stages launched from conventional aircraft.

The first phase of the XS-1 program, for which the solicitation applies, is to perform risk reduction and design. If approved the program would to proceed to the second and third phases to fabricate and fly an experimental autonomous spaceplane.

DARPA officials say they expect to make several contract awards for the XS-1 first phase, and spend about $14 million. If the program moves to the second and third phases, money available to contractors could increase to about $140 million.

Each phase 1 system contractor may receive contracts as large as $3 million, with options for an additional $1 million. If DARPA moves to the second and third phases, officials will downselect to one contractor.

The program's 13-month first phase is to evaluate the technical feasibility and methods for building a reusable space plane. It will develop the XS-1 demonstration concept; identify core component technologies; conduct critical risk reduction; and develop a technology maturation plan for flight demonstration and validation of system capabilities.

For questions or concerns, e-mail Jess Sponable, the XS-1 program manager, at DARPA-BAA-14-01@darpa.mil. The XS-1 solicitation and other information is online at https://www.fbo.gov/spg/ODA/DARPA/CMO/DARPA-BAA-14-01/listing.html. ←

Small UAVs begin taking on role of electronic warfare aircraft

BY **John Keller**

RIDGECREST, Calif.—An era may be dawning when small unmanned aerial vehicles (UAVs) are put into action as electronic warfare (EW) aircraft to enable warfighters operating on the forward edge of the battlefield to jam enemy radar, communications, and other RF systems.

UAV experts at the Northrop Grumman Corp. Aerospace Systems segment in Redondo Beach, Calif., have demonstrated an internal miniature electronic attack payload on the company's Bat UAV during testing at China Lake Naval Air Weapons Station in Ridgecrest, Calif. The demonstration in October involved equipping the Bat UAV with the Northrop Grumman Pandora electronic-attack payload, which is a low-cost derivative of the company's digital APR-39 EW payloads for electronic attack, support and protection. During the demonstration, Bat flew several missions together with manned fixed-wing aircraft and other UAVs.

"Bat continues to demonstrate capabilities that can normally only be achieved by larger, more expensive unmanned aircraft," says George Vardoulakis, Northrop Grumman's vice president of Medium Range Tactical Systems.

The catapult-launched low-flying UAV is operated by the U.S. Marine Corps, Navy, Air Force, and Department of Homeland Security by Swift Engineering. The UAV, which is recovered in a net, has a 10-to-12-foot wingspan and can carry payloads as heavy as 30 pounds. A Bat version with a 20-foot wingspan is being developed. Bat has blended wings made of lightweight composite materials that merge with the fuselage into an airfoil. The unmanned aircraft has net hooks in the nose and a rear push propeller. It can fly for as long as 15 hours, flies as fast as 70 miles per hour, and can reach altitudes to 15,000 feet.

The Bat UAV, shown above, has been demonstrated with electronic warfare capability.

The Bat is packed into a trainer and ground-control system, which are transportable by air on an MV-22 tiltrotor aircraft and on the ground by military vehicles as small as Humvees. Two people can operate the UAV, and its ground-control system controls the catapult launcher. It can carry a variety of payloads in addition to its EW radar jammer, including still-image and video cameras, infrared and synthetic aperture radar sensors, laser range finders, laser designators, communication equipment, chemical and biological detection systems, and flare dispensers.

Bat is designed to be a family of affordable, medium-altitude, multimission UAVs that can be configured with differently-sized fuel tanks and different sensor payloads for intelligence, surveillance, reconnaissance, target acquisition, communications relay, and now electronic warfare. ←

Special Operations experts eye wind sensors to improve aim

U.S. military researchers are surveying industry to find companies with the expertise to design wind-sensing technologies to improve the aim of machine guns and cannons on Air Force Special Operations Command (AFSOC) AC-130 gunship aircraft. Officials of U.S. Special Operations Command (USSOCOM) at Mac Dill Air Force Base, Fla., have released a request for information for technologies to improve wind detection and evaluation to improve the accuracy of unguided munitions for the AFSOC Gunship community. The RFI is for industry, academia, individuals, and government laboratories to submit wind-sensing ideas.

Hyperspectral sensor payload introduced by Headwall

Headwall Photonics Inc. in Fitchburg, Mass., is introducing the Micro-Hyperspec integrated airborne hyperspectral electro-optical sensor for manned and unmanned aircraft. Typical uses for hyperspectral electro-optical sensing from aircraft include precision agriculture, oil & gas exploration, and environmental monitoring. The core element is Headwall's Micro-Hyperspec hyperspectral sensor, which is based on the company's patented aberration-corrected sensor design. Aberration-corrected diffractive optics enable the sensor to achieve high signal-to-noise characteristics, wide field-of-view, and high spatial and spectral resolution. ←

Aero Simulation chooses projectors from Christie for Marine Corps AH-1W flight simulator

BY **John Keller**

CYPRESS Calif.—Flight simulation experts at Aero Simulation Inc. (ASI) in Tampa, Fla., needed projection systems for the U.S. Marine Corps AH-1W SuperCobra attack helicopter weapons systems trainer (WST) device 2F136A upgrades. They found their solution from Christie Digital Systems USA Inc. in Cypress, Fla.

ASI awarded a contract to Christie to supply 12 Christie Matrix StIM WQ 1-chip DLP solid-state LED projectors for the SuperCobra flight simulators, which help pilots train to use the AH-1W's array of weapons.

In 2015, six display system projectors will be installed at Camp Pendleton Marine Corps Base, Calif., and six at New River Marine Corps Air Station, N.C., Christie officials say.

The SuperCobra can carry a 20-millimeter Gatling cannon; Hydra 70 or Advanced Precision Kill Weapon System (APKWS) rockets; 5-inch Zuni rockets; TOW anti-armor missiles; AGM-114 Hellfire missiles; and AIM-9 Sidewinder anti-aircraft missiles.

The Marine Corps AH-1W WST device 2F136A upgrade project will modify and refresh two existing AH-1W flight simulators by replacing visual display projectors, image generators, and visual databases.

The modified trainers will help teach pilot and co-pilot cockpit familiarization, engine operation, tactical navigation, and emergency procedures. The trainer supports standalone tactical training, as well as integrated virtual training with other simulators.

Christie Digital Systems USA is providing projection systems for the U.S. Marine Corps AH-1W SuperCobra attack helicopter simulator.

The 2F136A WST produces a simulated environment that emulates real-world scenarios for AH-1W SuperCobra helicopter aircrews. Each trainer consists of two visual display domes.

The simulator's computer systems control two separate training platforms, one housing a pilot position and the other a co-pilot/gunner position. The system provides pilot and co-pilot/gunner switch weapon systems, integrated crew, and flight proficiency training. ←

FOR MORE INFORMATION visit **Christie Digital Systems USA** online at *www.christiedigital.com*.

Army ready to move laser-based aircraft missile countermeasures to full-scale development

BY **John Keller**

REDSTONE ARSENAL, Ala.—U.S. Army aviation experts are announcing plans to move to full-scale development a laser-based missile-countermeasures system intended to defend helicopters, tiltrotor aircraft, and slow-moving fixed-wing aircraft from shoulder-launched heat-seeking missiles.

Officials of the Army Contracting Command-Redstone at Redstone Arsenal, Ala., plan to award a two-year contract for the engineering and manufacturing development (EMD) phase of the laser-based Common Infrared Countermeasure (CIRCM) system.

CIRCM is an Army program to develop a lightweight, low-cost, and modular laser-based infrared protection system for U.S. helicopters and light fixed-wing aircraft. The technology primarily will provide defense against shoulder-fired, heat-seeking missiles, or MANPADS. The program is being developed to replace older suites such as the Advanced Threat Infrared Countermeasures (ATIRCM).

Currently teams from the Northrop Grumman Corp. Electronic Systems segment in Rolling Meadows, Ill., and the BAE Systems Electronic Systems segment in Nashua, N.H., are developing CIRCM under terms of technology demonstration contracts.

The upcoming EMD contract will downselect the program to one of the two contractors. Industry teams from Lockheed Martin Corp. and Raytheon Co. also have been involved in competition to build CIRCM.

The Army is getting ready to choose a final contractor to build the CIRCM laser missile defense system.

The CIRCM system on helicopters and slow-moving fixed-wing aircraft will detect incoming infrared-guided missiles and direct a laser beam to the missiles' infrared guidance systems to confused and disable the missile.

Infrared-guided missiles use heat-seeking sensors that target aircraft hot spots such as engine exhaust. Helicopters are particularly vulnerable to short-range ground-launched weapons such as shoulder-fired missiles and rocket-propelled grenades, as well as machine gun and rifle fire. The CIRCM system will provide a directional laser infrared countermeasure using modulating laser pulses to confuse missile guidance systems and cause them to miss their targets.

The winning contractor will provide an initial 1,076 systems to supply AH-64 Apache, UH-60 Black Hawk, CH-47, Chinook and future armed scout helicopters. Production is to begin as early as 2015 and deployment in 2017. The program is expected to be worth $1.5 billion to the winning contractor.

Army officials plan for 10 possible options to the winning CIRCM contractor, which if exercised could extend the EMD phase to four years. Options include follow-on aircraft integration such as the Army AH-64E attack helicopter; low-rate initial production (LRIP); and possible integration on U.S. Navy aircraft.

The EMD contract will ask the winning company to install CIRCM systems on the Army's UH-60M Black Hawk helicopter. One aim of the EMD phase is to develop manufacturable 120-pound CIRCM systems for small aircraft, and 155-pound systems for large aircraft.

The winning contractor will deliver eight CIRCM A-kits for testing and 21 production-quality CIRCM B-kits.

FOR MORE INFORMATION

visit **Northrop Grumman Electronic Systems** online at *www.northropgrumman.com*, **BAE Systems Electronic Systems** at *www.baesystems.com*, or the **Army Contracting Command-Redstone** at *www.garrison.redstone.army.mil*.

PRODUCT applications

SIMULATION AND TRAINING

Simthetiq delivers high-end 3D visual models for Fidelity next-gen training solutions

Simthetiq in Montreal sold a large series of 3D models to Fidelity Technologies Corp. in Reading, Pa., for use in the company's next-generation FidViewEX Image Generator.

Simthetiq standardized products are intended to address the increasing demand for higher levels of realism in modeling and simulation. The high-end content is engineered to plug and play with high-end software platforms and serious gaming engines, helping assuring compatibility with the latest shading and image processing technologies, such as FidViewEx.

"The confidence Fidelity shows in Simthetiq is a result of the continuous enhancements we make to our products to ensure they strike the perfect balance between performance and visual quality," says Simthetiq CEO Vincent Cloutier. "FidViewEX running our models clearly demonstrates how combining Simthetiq visual content with high-performance visualization software produces truly outstanding visual results."

"We knew we needed to boost the degree of realism depicted within our training systems, so we designed our FidViewEX Image Generator from the ground up, with an unprecedented level of performance in mind. The revolutionary Image Generator required affordable, high-end, 3D content that was optimized for real-time visualization; Simthetiq met this need with a library of high-quality, ready-to-drop-in 3D models that could be custom tailored to meet Fidelity's specific needs," describes Chuck Williamson, general manager, Fidelity Simulation and Training.

"With Simthetiq, we've achieved our goal of creating the most enhanced IG on the market, providing warfighters with an unparalleled visual experience through the use of realistic, accurate, and dynamic content designed to enhance the training experience," Williamson adds.

COMPONENTS

Navy chooses rugged glass axial lead PIN diodes for sensors and electronics from Aeroflex

U.S. Navy experts needed glass axial lead PIN diodes for sensors, electronics, electronic warfare (EW), and special warfare weapons. They found their solution from Aeroflex/Metelics in Londonderry, N.H.

Officials of the Naval Surface Warfare Center Crane Division (NSWC Crane) in Crane, Ind., have announced their intention to buy between 11,000 and 106,000 MMP7034 fast-switching low-power PIN diodes from Aeroflex/Metelics in a five-year contract.

PIN diodes are suitable for attenuators, fast switches, photodetectors, and high-voltage power electronics applications. NSWC Crane provides engineering and technical support for sensors, electronics, electronic warfare, and special warfare weapons.

NSWC officials will award an indefinite-delivery, indefinite-quantity (IDIQ) contract sole-source to Aeroflex/Metelics because the company is the only source of the diodes, and no other supplies or services will satisfy agency requirements, NSWC officials say.

Aeroflex is the original equipment manufacturer (OEM) of these diodes, and NSWC officials need electronic parts that meet exact form, fit, and function replacement part for existing equipment.

The Aeroflex/Metelics MMP-7000 series PIN diodes are manufactured using very high resistivity silicon epitaxial material grown on a highly

doped low resistivity substrate, Aeroflex officials say.

Combined with a grown junction P++ layer, MMP-7000 series PIN diodes yield a very abrupt structured "I" region with minimum outdoping and low voltage punch-through characteristics.

The high-temperature passivation and metallization produce diodes that are designed to cover a wide range of military and space applications in switching, phase switching, attenuating and limiting. The parts operate in temperatures from -55 to 150 degrees Celsius.

MORE INFORMATION IS online at *https://www.fbo.gov/spg/DON/NAVSEA/N00164/N0016414RGR51/listing.html*.

FLIGHT-LINE TEST

Navy looks to Exelis for avionics test systems for MH-60R and S-70B maritime helicopters

U.S. Navy helicopter avionics experts needed radar signal simulators for the MH-60R and S-70B Seahawk maritime helicopters. They found their solution from Exelis Inc. in Fort Wayne, Ind.

Officials of the Naval Air Warfare Center Aircraft Division in Lakehurst, N.J., announced a $7 million contract to Exelis for as many as 62 avionics radar signal simulators, which are for test & measurement of helicopter radar warning receivers, electronic surveillance measures, and electronic countermeasures systems.

Of these 62 radar signal simulators, 33 are for the U.S. Navy, 27 are for the government of Australia, and two are for the government of Brazil. The Australian and Brazilian sales are part of the Pentagon's Foreign Military Sales (FMS) program.

Exelis designs the AN/PLM-4 radar signal simulator (RSS). Some of these devices also are able to test helicopter missile warning systems. The PLM-4 is a user-programmable test set that generates pulse and scan modulated radio-frequency (RF) signals for testing electronics systems on helicopters and fixed-wing aircraft, as well as for surface ships and submarines.

The PLM-4 is designed to test the detection and identification capabilities of aircraft, surface ships, submarines, and land vehicles against hostile threats. Using internal antennas, the radar signal simulator radiates toward the system under test to enable the user to evaluate the unit's operation or perform diagnostics.

The Exelis PLM-4 is self-contained and operates from internal batteries or external AC power. It's small size enables one person to hand carry and operate it.

The RSS can be used for testing pods, on-board self-protection electronic countermeasures systems, radar warning receiver (RWR) systems and electronic warfare support measures (ESM) systems.

With the RSS remote terminal, the user can sit in the aircraft under test while he works. The remote terminal allows the user to control the functions of the unit. The PLM-4 also can connect avionics systems for testing and troubleshooting if the operator wants to bypass the antennas.

The PLM-4 has a built-in or external battery charger, and can be used remotely as far away from the test aircraft as 1,000 feet. The unit measures about one cubic foot, and weighs 20 pounds.

The unit's frequency range is 500 MHz to 18 GHz, with options to 40

GHz, with pulse repetition interval types: jitter, stagger and guidance triplets. It runs on universal AC power, auto-switching AC input, or on two removable lithium-ion batteries. The unit operates in temperatures from -40 to 55 degrees Celsius.

Exelis will do the work in Fort Wayne, Ind., and should be finished by November 2017.

FOR MORE INFORMATION visit **Exelis Inc.** online at *www.exelisinc.com*.

DATABUSES AND NETWORKING

Navy chooses Gigabit Ethernet switches and SFP transceiver modules from Advantech America

U.S. Navy ocean systems experts needed industrial-grade Ethernet networking switches and transceiver modules for a variety of embedded computing surface warship and ship systems research. They found their solution from the Advantech America Embedded & Network Computing Group in Irvine, Calif.

Officials of the Naval Surface Warfare Center (NSWC) Carderock Division in West Bethesda, Md., announced plans to buy 30 Advantech EKI-7758F 8G port industrial managed redundant Gigabit Ethernet switches and 30 Advantech SFP-GSX/LC-AE 1000 Base-SX multi-mode modules.

NSWC Carderock is the Navy's center of excellence for ships and ship systems, and performs research and development, test, and evaluation for the Navy's ships, submarines, military watercraft, and unmanned vehicles.

The Advantech EKI-7758F is a 4G+4 small form-factor pluggable (SFP) gigabit managed redundant industrial Ethernet switch with four copper Gigabit Ethernet ports and four SFP ports. The Advantech SFP-GSX/LC-AE is an SFP transceiver module for 1000 Base-SX Multi mode SFP module. It has an immovable lock design; is hot pluggable; duplex LC connector; full-duplex speeds; TTL signal detect indicator; 3.3-volt DC power supply; EMI performance for high port density; and is RoHS compliant.

FOR MORE INFORMATION visit **Advantech America Embedded & Network Computing Group** online at *www.advantech.com*.

AVIONICS

Curtiss-Wright to provide rugged Gigabit Ethernet switches for F-16 jet fighter upgrade

Military avionics designers at the Lockheed Martin Corp. Aeronautics segment in Fort Worth, Texas, needed rugged Gigabit Ethernet switches for an upcoming upgrade of the F-16 jet fighter. They found their solution from Curtiss-Wright Controls Defense Solutions in Ashburn, Va.

Curtiss-Wright won a contract from Lockheed Martin to supply COTS-based rugged Gigabit Ethernet switch technology for upcoming F-16 jet fighter upgrade programs for the U.S. Air Force and other nations. The

first of the upgrade programs is for the Taiwan air force. Curtiss-Wright will provide the SMS-652 SwitchBox rugged Gigabit Ethernet switch for Lockheed Martin-built F-16s. The initial contract is worth about $3 million, and shipments are scheduled to begin in the first half of 2014. The estimated potential value of the contract is about $8 million over the life of the additional upgrade programs.

The SMS-652 SwitchBox is an open-standards Gigabit Ethernet network switch for rugged military systems. Its compact subsystem eases integrating modern digital networked architectures into military platforms. The SMS-652 SwitchBox reduces design risk and shortens development schedules for bringing network-enabled operations to and legacy airborne, ground combat, and unmanned platforms. The SMS-652 is a Gigabit Ethernet network switch designed for rugged military airborne, ground vehicle, and space-constrained unmanned vehicle applications. The power-efficient switching fabric provides non-blocking wire-speed gigabit performance for 16 ports of 10-, 100-, and 1,000-megabit-per-second Ethernet connections.

Curtiss-Wright will do the work in its Ottawa facility, and ship the products to Lockheed Martin Aeronautics in Fort Worth, Texas.

FOR MORE INFORMATION visit **Curtiss-Wright Controls Defense Solutions** online at *www.cwcdefense.com*.

new PRODUCTS

To submit new products for consideration, contact John Keller at jkeller@pennwell.com.

HPEC

Mercury combines Ethernet and OpenVPX for high-performance embedded computing

Mercury Systems Inc. in Chelmsford, Mass., is offering Ethernet protocols for switched fabrics, cluster computing, and sensor I/O in OpenVPX-based high-performance embedded computing (HPEC) subsys-

tems. The company's Ensemble OpenVPX subsystems is combining with an Ethernet switched fabric using TCP/IP and sockets to enhance affordability and supportability, company officials say; users can take advantage of software applications, productivity tools, installed applications and support from several vendors. Mercury uses Intel Xeon server-class processing and wideband interconnects to deliver peak performance and affordability.

FOR MORE INFORMATION contact **Mercury Systems** online at *www.mrcy.com*.

TEST AND MEASUREMENT

Oscilloscopes for test and measurement of embedded systems offered by Teledyne LeCroy

Teledyne LeCroy in Chestnut Ridge, N.Y., is introducing the HDO4000-MS

and HDO6000-MS high-definition oscilloscopes for test & measurement of embedded systems. The oscilloscopes combine 16 channels of mixed-signal capabilities with HD4096 high definition technology, long memory, and a compact form factor, in bandwidths from 200 MHz to 1 GHz. All HDO models sport a large 12.1-inch touch-screen display and intuitive interface to enhance operation. Powerful debug tools, plus automatic measurements, and waveform math capabilities turn the HDO-MS oscilloscope into an all-in-one analog, digital, and serial debug machine.

FOR MORE INFORMATION contact **Teledyne LeCroy** online at *http://teledynelecroy.com*.

RUGGED CABLING

RF cables for distributed antenna systems and cellular stations offered by Times Microwave

Times Microwave Systems in Wallingford, Conn., is introducing TFT-LF cables for interconnect use in outdoor installations such as distributed antenna systems (DAS) and cellular base stations. Systems integrators can install these cables as an alternative low-cost solution compared to semi-flexible (solder braid) coax and RG type coax for RF and microwave interconnects in applications to 3 GHz. Unlike solder braid cables, the flat braid shield on TFT-LF cable is not susceptible to cracking when bent, which permits installation in tight spaces without the risk of compromising performance. Compared to standard RG cables, the flat braid shield provides

much better shielding and lower attenuation. The FEP jacket provides protection in corrosive environments and resists the effects of UV sunlight.

FOR MORE INFORMATION contact **Times Microwave Systems** online at *www.timesmicrowave.com*.

BOX COMPUTERS

Rugged computers for civil, military aircraft and autonomous vehicles introduced by GE

GE Intelligent Platforms in Huntsville, Ala., is introducing the CRS-D4I-3VB1 and the CRS-D8I-3VF1 commercial off-the-shelf (COTS) rugged embedded computers for demanding, harsh environments such as civilian and military autonomous vehicles, commercial and military aircraft, ground vehicles, helicopters, surface and underwater research vessels, and locomotives. These rugged computers are

available as pre-configured, ready-to-run systems, and are available on short lead times, GE officials say. The CRS-D4I-3VB1 is a conduction cold-plate-cooled 3U VPX computer housed in a 4-slot chassis using one single-board computer with an Intel Core i7 processor. The CRS-D8I-3VF1 is a 3U VPX embedded computer with an Intel Core i7 processor housed in a one-half-ATR rugged conduction forced-air-cooled chassis with eight slots.

FOR MORE INFORMATION contact **GE Intelligent Platforms** online at *www.ge-ip.com*.

POWER ELECTRONICS

Standard Microcircuit Drawings (SMDs) announced for VPT rad-hard power supplies

VPT Inc. in Blacksburg, Va., is introducing U.S. Department of Defense (DOD) Standard Microcircuit Drawings (SMDs) for VPT's SVR series of radiation-hardened DC-DC converters, point of load converters, and EMI filters. VPT's SVR series power electronics products were developed for extreme conditions in space. An SMD depicts the government's requirements for an existing commercial microcircuit that tested for a military application. An SMD discloses applicable configuration, envelope dimensions, mounting and mating dimensions, interface dimensional characteristics, specified performance requirements, and inspection and acceptance test requirements as appropriate for a military environment.

FOR MORE INFORMATION contact **VPT** online at *www.vptpower.com*.

CHASSIS AND ENCLOSURES

Customizable 3U CompactPCI rackmount computer for industrial use offered by Kontron (art: Kontron 24 Nov 2013.jpg)

Kontron in Eching, Germany, is introducing the CP-POCKET customizable 3U CompactPCI control cabinet embedded computer for price-sensitive applications such as machine and factory control, programmable logic controllers, and inspection systems. The CP-POCKET uses the Intel Celeron 807UE processor in a compact industrial computer packaged as a modular 3U CompactPCI server or downsized to a box-sized CompactPCI rackmount computer. The computer is designed to accommodate standard building blocks that enable users to define their dedicated wall mount systems. The Kontron CP-POCKET accommodates rugged CompactPCI peripheral boards that are accessible from the front; users can swap boards in a matter of seconds.

FOR MORE INFORMATION contact *Kontron* online at *www.kontron.com*.

DATA CONVERSION

Rugged D/A converter for aerospace and defense fast-analog uses introduced by DATEL

The DATEL business unit of Murata Power Solutions in Mansfield, Mass., is introducing the DAC-88 series of digital-to-analog (D/A) converters for aerospace and defense electronics applications where fast analog output settling speed are required. The DAC-88 series D/A converters are 12-bit, 3-microsecond D/A converters housed in a small hermetically sealed 24-pin DDIP or SMT gull-wing ceramic package. Each data conversion unit features guaranteed monotonicity and is 100 percent tested for performance across one of three specified temperature ranges: 0 to 70 degrees Celsius, -40 to 100 C, and -55 to 125 C. Output range is programmable to 20 volts, and includes bipolar options. Tight resistor thermal tracking equates to DNL tempco

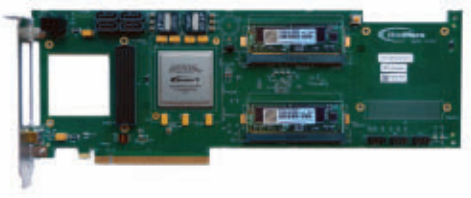
of +2ppm maximum, which assures reliable performance over the military operating range.

FOR MORE INFORMATION contact **DATEL** online at *www.datel.com*.

BOARD PRODUCTS

FPGA embedded computing for signal processing, data acquisition offered by BittWare

BittWare in Concord, N.H., is introducing the S5-PCIe-F (S5PE-F) embedded computing board based on the high-bandwidth, power-efficient Altera Stratix V GX/GS field-programmable gate array (FPGA) for high-performance signal processing and data-acquisition applications. FMC site support based on the VITA 57 mezzanine standard for FPGA I/O provides SerDes and LVDS, along with clocks, I2C, and JTAG connected directly to the Stratix V enabling designers to customize the S5PE-F with a variety of I/O or processor FMCs.



A new memory structure provides flexibility with two SODIMM sites that support as much as 16 gigabits of DDR3 SDRAM with optional error-correcting codes (ECC) as well as options for as much as 1 gigabyte of RLDRAM3 and as much as 72 megabytes of QDRII+.

FOR MORE INFORMATION contact **BittWare** online at *www.bittware.com*.

MOBILE COMPUTING

Miltope and HP join on semi-rugged notebook for relatively benign military conditions

VT Miltope of Hope, Hull, Ala., is joining forces with Hewlett Packard Co. in Palo Alto, Calif., to offer the SRNC-17 semi-rugged notebook computer for military applications relatively benign conditions that require extra durability. The SRNC-17 is a ruggedized version of the HP ZBook 17 mobile workstation, and comes with the 4th Generation Intel Core i7 processor, Mobile Intel 8 series QM87 Express chipset, and either the Windows 7/8 or Linux 64-Bit operating systems. The rugged laptop computer is designed and tested to military specifications and environmentally screened to withstand harsh conditions.

FOR MORE INFORMATION contact **VT Miltope** online at *http://mymiltope.com*, or **Hewlett Packard** at *www8.hp.com*.

EMBEDDED COMPUTING

3U VPX GPGPU embedded computing board for sensor processing and C4ISR offered by Aitech

Aitech Defense Systems Inc. in Chatsworth, Calif., is introducing the C530 3U VPX general-purpose graphics processing unit (GPGPU) embedded computing computer for advanced sensor processing and applications in command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR). The C530 carries industry-standard MXM modules with the ability to upgrade to newer modules as they become available, Aitech officials say. The MXM modules enable one module to function across several platforms, providing expanded graphics and teraflop processing options for each system. The C530 GPGPU board comes with one of two MXM modules: the NVIDIA GeForce GTX 675MX at 600 MHz; 4 gigabytes of GDDR5 memory at 1800 MHz; or the AMD Radeon HD 7970M at 850 MHz; 2 gigabytes of GDDR5 memory at 1200 MHz.

FOR MORE INFORMATION contact **Aitech** online at *www.rugged.com*.

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Tom Bielek

An aerospace and defense system engineer discusses the adoption and advancement of unmanned vehicles for civil and military applications.

What regions are increasing the use of unmanned vehicles?

Strong growth is expected across the board for military, security, and commercial applications. Although the demand for unmanned aerial vehicles (UAVs) is high, the growth rate is somewhat mitigated by budgetary constraints in most NATO countries for military applications. In the commercial sector, growth is hampered by unclear legislative and regulatory situations in most countries. The U.S. market is expected to remain the dominant market for UAVs and is expected to account for more than 40 percent of the global market in the next five years. The Asian and Middle-Eastern markets are showing strong growth. Although Europe sees an important and strategic need to develop its UAV market, it is still marked by a lack of concerted effort in its UAV development programs.

What concerns or challenges are associated with unmanned vehicles?

Most of the command and control (C2) technology challenges are well known such as collision avoidance, data fusion from multiple sensors, autonomous operation, communications bandwidth and security, etc. and are applicable to both civil and military use.

In the military domain, another challenge has to do with morphing traditional air defenses to deal with the sheer number and type of UAVs—everything from miniature germ-carrying machines to full-size hunter-killers armed with missiles and laser weapons. For example, in October 2012, a UAV entered Israeli airspace in spite of its "Iron Dome" air defense system. While the system can readily detect and shoot down short-range guerrilla rockets, it did not intercept the slow-flying aircraft. An Israeli fighter later destroyed it but the cost and method of doing so could be viewed as overkill. Further, it might be impractical in a massive UAV attack.

Is it possible to take out a swarm unmanned aircraft, operating autonomously with redundant systems and encrypted data links?

As UAVs become more countermeasure-immune, air defense strategies and technologies will have to keep pace. Most industry and government resources are focused on improving UAV capabilities but when you turn the picture around and look at what it will take to defend against this evolving threat, the implications are immense.

Avoiding detection is another challenge. Stealth technologies exist for manned aircraft but have not been implemented to a large extent with the current fleet of UAVs. Silencing engine noise, especially in low speed, low altitude UAVs is another problem. Noise cancellation techniques to reduce noise at the source before it radiates outward is an area that should be explored with the same attention as that given to quieting submarines during the Cold War. ←

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