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Commodity technology and its threat to capability and innovation

There's a lot of benefit to the military's continuing use of commodity electronic components and subsystems; this approach can lead to low costs, predictable interoperability, and for the most part acceptable performance. We all should be mindful, however, of how the misuse of commodity technology may threaten to stifle technological innovation.

Military leaders need to remember some of the potential drawbacks of commodity technology, particularly when program managers adhere to dogged commodity specifications imposed to ensure the use of commercial off-the-shelf (COTS) guidelines. The point to remember is this: the military doesn't need commodity technology, per se; the military needs capability.

I support the use of COTS to the fullest extent possible; it's crucially important, is part of the fabric of our military procurement system, and should remain so. In many cases, technologies rightly defined as COTS have some of the best value-added benefits that industry has to offer, and can represent major capability enhancements. What I mean by commodity is garden-variety technology that's available to everybody. Program managers and purchasers should not pursue commodity technology blindly as the only way to meet COTS requirements. They should give at

least equal weight to military capabilities when considering new designs and systems upgrades.

Commodity technology often can represent the best capability for the money. Much of the time commodity makes sense, yet we should keep our minds open to the possibility that in some instances commodity might not be the best solution, and in fact might discourage innovation that could lead to a big increase in military capability.

The next war likely will involve adversaries whose technological capabilities, tactics, and strategies are at least on a par with those of the U.S., perhaps even better. That means no more free rides in military operations against a technologically inferior foe. Every inch of ground, every bit of airspace, every wave of the ocean in tomorrow's battle theater will be contested against a foe with modern jet fighter aircraft, stealthy radar systems, potent electronic warfare (EW) capabilities, and formidable cyber warfare abilities.

Despite these threats, military leaders still place substantial value on using commodity technology in military systems — sometimes even at the expense of solutions that offer innovation and enhanced capabilities.

Yes, using commodity technologies can reduce costs. Using incremental system block upgrades can reduce the risk of expensive system redesigns.

Deferring maintenance and upgrades can save money — for a while.

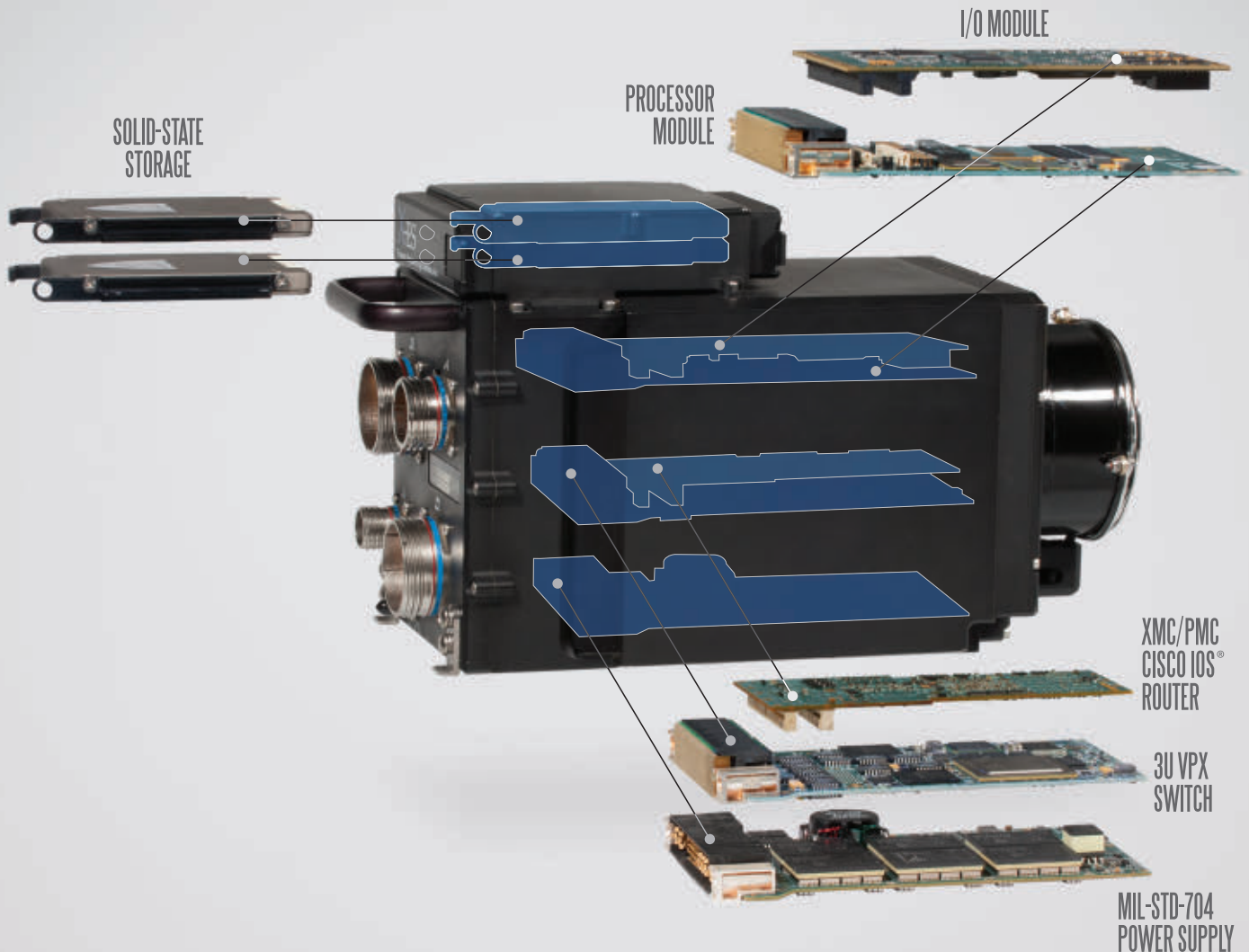
With the prospect of facing potential foes who are on technological parity with the U.S., is focusing solely on costs and commodity technology really the way to go? When it comes to boosting military capability, can using commodity technologies still move the needle? To be honest, maybe not; it's like marching in place.

The days of simply maintaining the status-quo by using the latest generations of commodity technologies may be short-sighted and wrong-headed. In an industry competition that involves only commodity technologies widely available anywhere on Earth, the only differentiator is price; rarely does capability even enter the discussion. Worse, however, is that competing on only cost with clearly specified commodity technologies may be stifling innovation. With no incentive for genuine increases in capability, commodity-based competition is a race to the bottom on price. How well does that bode in a world as dangerous as ours, and one that is becoming more so with each passing day?

It's time for capability to take priority over reducing costs. These are desperate days, and maintaining the status-quo with commodity technology isn't going to cut it. Wait too long, and it just might be too late. ◀

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Lockheed and Raytheon develop smart bullets to defend ships from swarm attacks

BY JOHN KELLER

ARLINGTON, Va. — Lockheed Martin Corp. is joining Raytheon Co. in an advanced effort to develop a military surface ship defense using medium-caliber smart bullets that enable Navy vessels to ward off swarming attacks from aircraft, missiles, and fast attack boats bearing down from many different directions at once.

Officials of the U.S. Defense Advanced Research Projects Agency (DARPA) in Arlington, Va., made an \$8.2 million order in February to the Lockheed Martin Corp. Missiles and Fire Control segment in Grand Prairie, Texas, for phase II of the Multi Azimuth Defense Fast Intercept Round Engagement System (MAD-FIRES) program.

DARPA awarded an \$8 million order in January to the Raytheon Co. Missile Systems segment in Tucson, Ariz., for MAD-FIRES phase II. The two companies won phase I contracts for the program in February 2016.

MAD-FIRES seeks to create a gun launched, medium-caliber, guided, actively controlled projectile with significantly improved range and accuracy over current systems. It would combine the guidance, precision, and accuracy of missiles with the speed, rapid-fire capability, and large ammunition capacity of bullets fired from automatic weapons.



In the future, naval deck guns may be able to fire independently targeted smart munitions, rather than simply throwing out a curtain of metal bullets.

Attacks by unmanned aerial vehicles (UAVs), missiles, small planes, fast in-shore attack boats, and other maritime threats pose a deadly and evolving threat to ships and other maritime vessels, DARPA officials say.

These kinds of threats demand that Navy ships have access to leading-edge defensive capabilities, specifically an ability to engage multiple and diverse targets coming from a range of directions and do so rapidly and with high precision using current close-range shipboard gun systems.

MAD-FIRES aims to advance the state of the art in defensive gun systems by creating a new, low-cost technological foundation for guided, gun-launched projectiles.

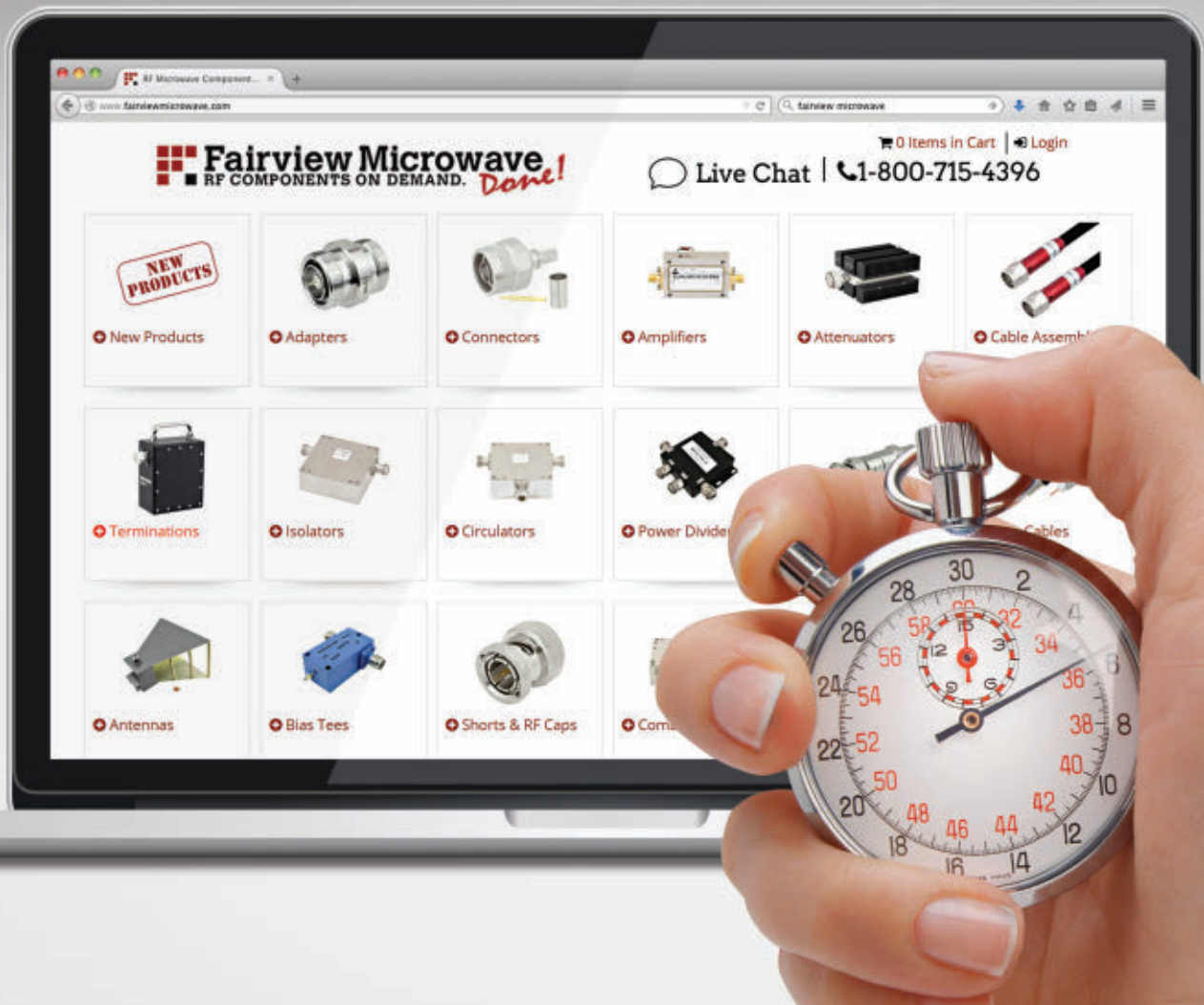
The program seeks to incorporate enhanced ammunition rounds able to alter their flight path in real time to stay on target, and a capacity to target, track, and engage several

IN BRIEF

General Dynamics to upgrade Army intelligence and EW simulation

Simulation and training experts at General Dynamics Corp. will enhance the capabilities of a U.S. Army intelligence and electronic warfare (EW) electronic simulator to improve the training of U.S. military intelligence analysts. The Army Program Executive for Simulation, Training, and Instrumentation (PEO STRI) in Orlando, Fla., announced a \$9.7 million contract to the General Dynamics Corp. Mission Systems segment in Laurel, Md., for enhancements to the Intelligence and Electronic Warfare Tactical Proficiency Trainer (IEWTPT). The IEWTPT simulates and stimulates military intelligence warfighting equipment and tools to provide proficiency and sustainment training for military intelligence personnel, battle staff, system operators, collectors, and analysts. Army intelligence experts are asking General Dynamics to start with the existing IEWTPT block 1 baseline and add block 2 military intelligence training capabilities to augment, enhance, and improve the current IEWTPT's military intelligence training capabilities. ◀

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fast-approaching targets simultaneously and re-engage any targets that survive the initial engagement.

Raytheon and Lockheed Martin previously won MAD Fires phase 0 contracts to define concepts and establish a modeling and simulation baseline for the program.

Phase 1 of the MAD-Fires program involved preliminary risk-reduction demonstrations.

Moving to phase II of the MAD-FIRES program, Lockheed Martin and Raytheon now will focus on projectile development and performance. A potential third phase

would demonstrate the final MAD-FIRES technologies in an operational military environment.

Lockheed Martin will do the work in Grand Prairie, Texas; Minneapolis; Montville, N.J.; Dallas; Brea, Calif.; Bethesda, Md.; Keyser, W. Va.; Marion, Ill.; and Westminster, Md., and should be finished in November 2017. Raytheon, meanwhile, will do its work in Tucson, Ariz.; Chelmsford, Mass.; and McKinney, Texas, and should be finished in March 2018.

FOR MORE INFORMATION visit Raytheon Missile Systems online at www.raytheon.com, Lockheed Martin Missiles and Fire Control at www.lockheedmartin.com/us/mfc.html, or DARPA at www.darpa.mil.

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Rockwell Collins builds VLF military communications for B-2 bomber

BY JOHN KELLER

WRIGHT-PATTERSON AFB, Ohio — Military communications experts at the Rockwell Collins Government Systems segment in Cedar Rapids, Iowa, are starting full-rate production of a secure and jam-resistant very low frequency (VLF) radio for the U.S. Air Force B-2 stealth bomber to enable the aircraft crew to communicate with national

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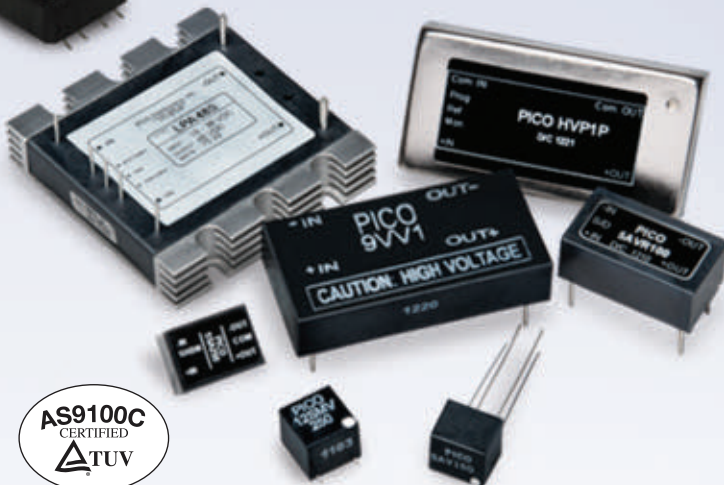
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command authorities while on long-range missions.

Officials of the Air Force Life Cycle Management Center at Wright-Patterson Air Force Base, Ohio, are awarding a \$12.9 million contract to Rockwell Collins for full-rate production of increment 1 of

the Common Very Low Frequency Receiver (CVR) program.

U.S. strategic bombers typically communicate over UHF satellite communications (SATCOM) links, as well as the MILSTAR SATCOM system. These SATCOM links, however, are nearing the end of their

anticipated life cycles. Their strategic communications replacement, the Advanced Extremely High Frequency (AEHF) SATCOM system, will not be ready for several years, officials explain.

Rockwell Collins began full-scale development of the CVR in late 2013, which involved modifying, qualifying, and testing a B-2 bomber VLF communications system, consisting of a terminal and receiver, antenna, human machine interface (HMI) display, and ancillary cabling, rack, and equipment to enable receipt and display of emergency action messages.

The CVR that Rockwell Collins is building for the B-2 bomber will form a bridge between the UHF SATCOM and MILSTAR systems and the future AEHF SATCOM system.

Rockwell Collins has developed the B-2's VLF communications system over the last four years in efforts to make the system available for the B-2 fleet by as early as this year. This time frame allows for only a modification and qualification program, not a full development program.

Rockwell Collins engineers have designed the B-2 CVR system to operate in the airborne nuclear combat environment, be secure, and be survivable, Air Force officials say. It is nuclear hardened and meets stringent cryptographic requirements.

On this contract, Rockwell Collins will do the work in Richardson, Texas, and should be finished by March 2019. ⬅

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The destroyer USS Zumwalt (DDG-1000) is heavily armed for land attack, surface warfare, and anti-air warfare. (Navy photo)

Navy pushes for more ships, technology breakthroughs

BY **Edward J. Walsh**

Last September, the Navy, Marine Corps, and Lockheed Martin Rotary and Mission Systems showed how to shoot down fast-flying enemy missiles by using data from the new F-35B Lightning II Joint Strike Fighter to the Navy's Aegis combat system, which directed the SM-6 missile defense missile to destroy the target.

Navy and Lockheed Martin officials say the demonstration at White Sands Missile Range in New Mexico showcased the effectiveness of the Aegis Baseline 9 program

to enable weapons to engage long-range targets, a capability required for the Navy's "Distributed Lethality" vision pioneered by Vice Adm. Thomas Rowden, commander of Naval Surface Forces.

Rowden, speaking at the Surface Navy Association national symposium in January, said "Distributed Lethality requires an offensive mindset that enables the goal of sea control by increasing offensive firepower, improving battlespace awareness, and supporting the Navy's 2018 shipbuilding plan."

The Distributed Lethality vision adds urgency to Navy efforts to design and build the right types of ships in the right numbers to support dramatic shifts in the U.S. defense strategy. Today, the Navy has 273 deployable "battle-force" ships.

Shipbuilding

Navy leaders laid their cards on the table last December in a new Force Structure Assessment (FSA) — the first since 2012 (updated in 2014). It calls for increasing the nation's fleet of surface ships and submarines by nearly one-third. The assessment calls for a fleet of 355 ships, including 12 aircraft carriers, 104 large surface combatants, 52 small surface combatants, 38 amphibious ships, 66 attack submarines, 12 ballistic missile submarines, and 71 logistics, transport, and support ships.

Navy officials say the FSA will be an input in the 2018 30-year

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SPECIAL REPORT

shipbuilding plan, but was "not constrained by Budget Control Act funding levels."

Meanwhile, the Navy has moved to engineering development of the strategic ballistic missile submarine (SSBN) replacement of the Ohio class, which leaders say is the nation's top defense priority. This program aims at a construction start date of October 2020 for the first vessel, Columbia (SSBN-826). The Navy wants Columbia on patrol by 2031.

The Navy proposal to build more ships responds in part to the need to maintain a strong presence in the Pacific to counter the growth of China's navy. In late December in the South China Sea, a Chinese ship picked up a U.S. Navy unmanned undersea vehicle conducting an unclassified oceanographic research mission, underlining the tensions between the Pacific superpowers.



The Navy's controversial class of littoral combat ships will represent the bulk of the "small surface combatants" in the future fleet. Here, USS Independence (LCS-2), the first of the "trimaran" variant, steams off the southern California coast. (Navy photo)

Also in December the Chinese navy conducted the first live-fire drills from its one aircraft carrier, Liaoning, a 60,000-ton former heavy cruiser acquired from Russia in 1998. After extensive refitting and addition of a ski-jump flight deck, China commissioned the ship in 2012.

The Center for Strategic and International Studies (CSIS) notes that the ship may be capable of 20-knot speed and could deploy an airwing of 24 J-15 fighters.

While less capable than the U.S. Navy's 98,000-ton Nimitz-class carriers, the Chinese ship is larger than the Indian navy's 45,000-ton Vikramaditya and Japan's Izumo, a 27,000-ton helicopter carrier.

Naval experts believe that carrier operations will extend China's reach in regional waters, enabling it



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to intimidate its neighbors. CSIS reports that China is building a second carrier using an entirely Chinese design.

In the Med, increased Russian naval activity resulting from its annexation of the Crimea, aggression in Ukraine, and involvement in the Syrian civil war underlines the U.S. Navy's mission there.

Navy, U.S. Department of Defense (DOD), and private studies in recent years have proposed a Navy of between 308 and 350 ships. A National Defense Panel report in 2014 called for 346 ships.

All these studies recommend different numbers of submarines, surface combatants, carriers, and amphibious ships. The totals would affect the Navy's long-term planning

and raise the question of whether larger numbers would be affordable.

Attack submarines

Attack submarines (SSNs), which the FSA increases from 48 to 66 boats, have been a Navy success story in recent years.

Program Executive Officer for Submarines Rear Adm. Michael Jabaley says that building more SSNs would require adding capacity and expanding the workforce at shipbuilder General Dynamics Electric Boat in Groton, Conn., which also built the Ohio-class SSBNs.

The Navy now is taking delivery of two Virginia-class boats per year. In October, the Navy commissioned Illinois (SSN-786), the 13th Virginia-class attack boat and the ninth

consecutive ship to be delivered early by Electric Boat.

Illinois, the third of eight Block III Virginia-class SSNs, has a redesigned bow and replaces 12 torpedo tubes with two tubes capable of launching six Tomahawk cruise missiles. The Navy also has 39 Los Angeles (SSN-688) and three Seawolf-class (SSN-21) SSNs.

Supporting both attack and ballistic missile submarines is the Navy's hugely successful acoustic rapid commercial off-the-shelf insertion (ARCI) program.

ARCI sonar processing

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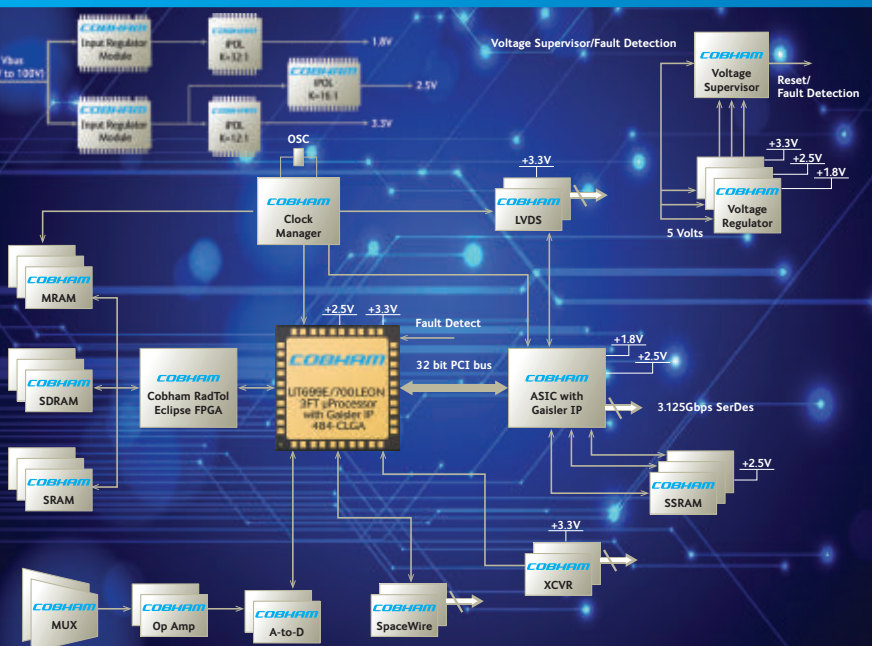
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ARCI introduces general-purpose processors, field-programmable gate arrays, embedded servers, and other components for hull-mounted sonar arrays, towed arrays, and other sensors. The ARCI upgrades are accomplished through biennial technical insertions (TIs) of hardware, like servers and storage devices, during odd-numbered years, and software revisions, also biennial, called advanced process builds (APBs), in even-numbered years.

The ARCI program is run by the Submarine Acoustic Systems program office, with the Program Executive Office for Integrated



A Marine Corps F-35B Lightning II Joint Strike Fighter acted as a "data provider" to help the Marine Corps and Navy integrate targeting data for the latest version of the Aegis combat system. (Marine Corps photo)

Warfare Systems (PEO IWS) in charge of software development.

Officials say that risks of these complex TI and APB upgrades are

reduced by leveraging them against fielded systems. PEO IWS introduced APB-15 software using the already tested TI-14 hardware. The

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Acoustics Systems office developed TI-16 hardware using the APB-15 software.

Lockheed Martin has been the key player in ARCI. In December 2016, the company's Manassas group won a \$13.2 million Navy award for BVY-1 integrated submarine imaging systems; and in November, the group won a \$125 million modification to an earlier award for ARCI system engineering and production work.

Zumwalt class

The year's highlight for the surface Navy was the October commissioning of Zumwalt (DDG-1000), the first of a new three-ship class of 610-foot-long 15,600-ton destroyers (Arleigh Burke destroyers displace 9,700 tons) built by General Dynamics Bath Iron Works, originally to provide fire support to land forces.

The Zumwalt class, with its futuristic design intended to reduce radar cross-signature dramatically and "tumblehome" bow, has been controversial and expensive. The Navy's FY 2017 budget submission identified the cost of the three-ship class at \$12.73 billion, or more than \$4 billion per ship. Research and development bring the total program cost to about \$22.5 billion.

The Zumwalts are armed with two advanced gun systems and vertical launch tubes for launching Tomahawk cruise missiles, evolved Seasparrow and Standard SM-2 air-defense missiles, and vertical-launch, anti-submarine rockets. Primary radar is a Raytheon-developed S- and X-band multifunction radar.

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system that distributes power for propulsion and ship systems from four Rolls-Royce gas turbines generating 78 megawatts of power to advanced induction motors developed by Converteam (bought by GE in 2011), which turn the drive shafts.

Zumwalt suffered an engine casualty enroute from its commissioning in Baltimore to San Diego while transiting the Panama Canal. Navy officials said the port shaft lost power, caused by water leakage through bearings that link the advanced induction motors. The casualty follows earlier engine problems off Norfolk, Va., and Florida after commissioning.

The two remaining ships, Michael Monsoor and Lyndon B. Johnson (DDGs-1001 and -1002) are under construction at Bath.

Littoral Combat Ship

The Littoral Combat Ship (LCS) program has been roiled by controversy. Growing costs and engine breakdowns with ships underway led then-Defense Secretary Ashton Carter in December 2015 to direct the Navy to restrict the class to 40 ships, down from the 52 planned.

The December FSA stands by 52, dubbed small surface combatants, but the Navy is now modifying the LCS design for the last 12 by adding armor and weapons and designating those ships as frigates.

The LCS program, the Navy's solution to replacing the Oliver Hazard Perry-class (FFG-7) frigates and two classes of minehunters, has been blasted by critics. In testimony before the Senate Armed Services Committee in early December, Paul Francis, managing director of acquisition and sourcing management

of the Government Accountability Office, said that the ships' costs have doubled from \$220 million to \$478 million and the 12 LCS-derived frigates planned could cost \$14 billion.

Responding to critics, Vice Admiral Rowden and Sean Stackley, Assistant Secretary of the Navy

integrated with mission personnel and either the MH-60R (for ASW and anti-surface) or the MH-60S (mine countermeasures) helicopters, are called mission "packages."

Northrop Grumman is developing the modules, in separate increments, separately from the shipbuilding



Arleigh Burke class (DDG-51) destroyers will receive the Aegis combat system Baseline 9, which enables them to conduct integrated air and ballistic missile defense. (Navy photo)

for Research, Development & Acquisition, told Congress that "the LCS program is on budget and below the Congressional cap."

The LCS comes in two variants: the traditional-hulled Freedom-class (LCS-1), with odd hull numbers, is built by Fincantieri Marinette Marine in Marinette, Wis., with Lockheed Martin as combat systems integrator. Austal USA, Mobile, Ala., builds the even-numbered Independence (LCS-2) three-hulled trimaran, with systems integration by General Dynamics Advanced Information Systems.

In late December, the Navy took delivery of its ninth LCS and fifth trimaran, Gabrielle Giffords (LCS-10). Eighteen more ships are under construction or under contract.

The LCSs will embark mission modules for anti-submarine and anti-surface warfare and mine countermeasures in littoral, or coastal, waters. The modules, when

program. The surface warfare module has been employed operationally by Fort Worth (LCS-3), and the first two increments have achieved initial operational capability (IOC), with full operational capability planned for 2020. The mine warfare and ASW modules still are at varying stages of development and testing.

Five LCSs experienced serious propulsion system failures in 2016, prompting the Navy, in July, to stand down operations for a comprehensive review of procedures and additional training. As a result, the Navy last September dramatically reorganized the program, designating the first four ships as test ships and merging the crews of following ships with the module crews.

Stackley and Rowden pointed out that of the five propulsion casualties, two were due to non-compliance with procedures, one was design-related, and two were caused by construction shortcomings.

Navy officials said also that “the Navy has taken a consistent and rigorous approach in assessing and addressing root causes of equipment casualties in LCS,” adding that “there is still work to be done in increasing the operational availability of the ships in service.”

In 2014 then-Secretary of Defense Chuck Hagel told the Navy to come up with a new design for a ship at least as survivable as the rugged Perry-class frigates.

A small surface combatant task force developed concepts for an LCS-derivative frigate armed with an over-the-horizon missile like the long-range, anti-ship missile (LRASM), the SeaRAM defensive missile system, Longbow Hellfire missile, already test-fired from an LCS, and an ASW sonar.

A draft request for proposals for the new frigate was set for release early this year, with a “clean design” expected this summer, a formal request for proposal (RFP) by year end, and construction award by late 2018. The Navy would downselect to one ship-builder for the frigate program. Twelve ships are planned, with first delivery in 2023.

Aegis modernization

A good-news Navy story for 2016 has been the modernization of the Ticonderoga-class cruisers and Arleigh Burke-class destroyers.

The modernization adds the Navy integrated fire control – counter-air (NIFC-CA) capability, a new SPQ-9B surface search radar, new RAM terminal defense missile, and other upgrades. The centerpiece of the effort is the insertion of the Baseline 9 Aegis combat system

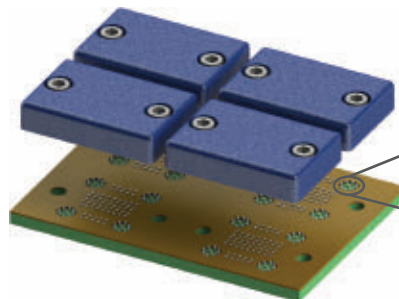
program used for the F-35B demo at White Sands.

The cruisers are getting an upgraded version of Baseline 9 that provides enhanced anti-air warfare capability built around the Aegis SPY-1 radar. However, the cruisers won’t get the more advanced

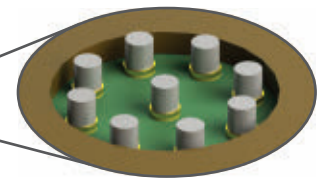
version of Baseline 9, which provides integrated air and ballistic missile defense (BMD). That program is going only to in-service and future Burkes, and to the two Aegis Ashore sites, one in service in Romania and a second in Poland, set to stand up this year.

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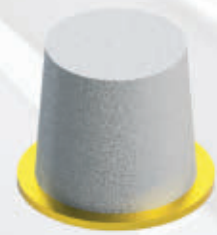
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The Navy's 22 Ticonderoga class cruisers are going through a bow-to-stern modernization including a range of new combat and sensor systems. Here, USS Shiloh (CG-67) and Chancellorsville (CG-62) transit the Pacific to join the Navy's Seventh Fleet. (Navy photo)

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The Burke-class ships are built in "flights" based on the evolution of capabilities. Flight I ships are the first-of-class Arleigh Burke (DDG-51) through DDG-71. Flight II ships are DDGs-72 through -78; Flight IIA includes hulls -79 through at least -122, but possibly -123 or -124, depending on which ship becomes the first of 13 planned for Flight III.

Lockheed Martin now is refining Baseline 9 to provide the advanced BMD for in-service destroyers and those under construction. The Flight III Burkes will get a new Raytheon-built SPY-6 air-missile defense radar, still integrated with Aegis and running still-newer Baseline 10 software with the new BMD program.

Jim Sheridan, Lockheed Martin's vice president for Naval Combat & Missile Defense Systems, says that the company supports accelerating a Navy-Missile Defense Agency initiative to refurbish the Aegis SPY-1 phased array radar for earlier Burkes by installing low-noise amplifiers and upgrading their combat systems.

Sheridan also recommends installation of a solid-state SPY-1 radar for all the destroyers designated Flight IIA (Oscar Austin DDG-79 up to the first Flight III ship). The Flight IIAs, he notes, will be the core of the Burke class into the 2040s.

The new SPY would use the S-band, solid-state gallium nitride technology developed for a long-range discrimination radar the company is building for the Missile Defense Agency to be based in Clear, Alaska, for ballistic missile defense.

The Burkes are built by General Dynamics Bath and Huntington

Ingalls Shipyards in Pascagoula, Miss. Huntington Ingalls delivered John Finn (DDG-113) on 7 Dec. 2016. By coincidence, the ship is named after Lt. John Finn who, while a petty officer, was awarded the Medal of Honor for bravery during the Pearl Harbor attack.

Rafael Peralta (DDG-115), the 65th Burke, was scheduled to deliver in February. Bath is set to build the first Flight III ship, to be the third ship funded in FY 2016, planned for delivery in 2023.

Aircraft carriers

The Navy now has 10 Nimitz-class carriers, CVNs 68 through 77 (George H.W. Bush, commissioned in January 2009). The Navy is supposed to have 11 CVNs and 10 carrier air wings, but Enterprise (CVN-65) was decommissioned in late 2012. When it enters service, Gerald R. Ford (CVN-78) lead ship of the four-carrier Ford class, will become the 11th flattop, with a 50-year service life.

Huntington Ingalls Industries, the Navy's only carrier builder, continues work on John F. Kennedy (CVN-79).

Navy officials say that design innovations for the Ford class will enable it to go to sea with 700 fewer personnel than the Nimitz-class ships. Ford introduces a new type of nuclear reactor, an electromagnetic aircraft launch system, advanced arresting gear (AAG), and dual-band SPY-3 radar built by Raytheon.

These and other design upgrades, the Navy says, will enable a 33 percent increase in aircraft sorties. Ford was scheduled to be delivered to the Navy late last year, but failure of voltage

regulators in two main turbine generators last summer pushed delivery to next month.

General Atomics, builder of the electromagnetic aircraft launching system (EMALS) and the AAG, announced in December that the system achieved the first-ever

recovery of a Navy F/A-18E Super Hornet fighter/attack aircraft.

Kennedy is set for delivery in June 2022. Huntington officials say the program is intensively focused on reducing costs experienced in construction of Ford, which is estimated to cost nearly \$12.9 billion.



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The next two Ford-class ships, Enterprise (CVN-80) and CVN-81, will be ordered in 2018 and 2023, respectively.

Amphibious assault ships

Navy and Marine Corps leaders say they need 38 amphibious ships, but now are getting 34: eight Wasp (LHD-1) and three America-class (LHA-6) "big decks," 12 San Antonio-class (LPD-17) ships, and 11 ships of a new class now called the LX, which will replace eight Whidbey Island (LSD-41) and four Harper's Ferry-class (LSD-49) dock landing ships.

The eight Wasp LHDs and two follow-on, America-class LHAs are built to support helicopters and V-22 Osprey aircraft. LHA-8 will restore a welldeck for use by landing craft. The San Antonios, built by Huntington Ingalls, and the LSDs launch landing craft to carry war-fighters and equipment shoreward.

In August, the General Dynamics NASSCO yard won a \$24.3 million award for LHX design. The Navy plans to award an LX construction contract in 2019.

Technology

Navy technology leapt forward in 2016. Critical to the success of the White Sands demonstration in September, says Lockheed Martin's Sheridan, is an Aegis common source library, a permanent repository of components for all Aegis program code, technical specifications, test parameters, and other components.

The common source library, Navy-owned but maintained by the company, is the source of all Aegis

capabilities. The Navy and the five international navies that use Aegis are able to configure their own systems by selecting programs from the common source library based on their own requirements.

The Navy moved forward in hull, mechanical, and electrical technology with the production of hybrid electric drive propulsion systems, including electric motors, motor drives, control software, and other components for installation on 36 Burke-class destroyers.

L-3 Communications Maritime Systems won a 2012 contract for two prototype systems for testing, with options for follow-on production of two shipsets, exercised by the Navy in 2015.

The hybrid electric drive uses electric drive motors fixed to the propeller shaft reduction gears and powered by the generators that power the non-propulsion systems. At low speeds, the system is considerably more efficient than the gas turbines used at higher speeds.

The Navy fielded a hybrid electric drive system aboard Makin Island (LHD-8), the only LHD powered by gas turbines (others use diesels), and America (LHA-6). Tripoli (LHA-7) will get hybrid electric drive during construction.

Navy and industry officials say that hybrid electric drive represents a step toward full-up integrated electric drive (IED), a decades-long goal of the surface community. The Navy initially planned a full integrated power system for the Zumwalt destroyers, using a high-torque permanent magnet motor, but instead selected the more conventional GE advanced induction motor.

Raytheon Missile Systems introduced upgrades to an active seeker array for the Tomahawk Block IV cruise missile that will enable it to hit mobile and sea-based targets. The company tested the new seeker against land-based mobile targets and against Navy Third Fleet ships off San Diego.

Raytheon says the processor uses a modular design that is common to many weapon systems. The Navy is funding more work this year.

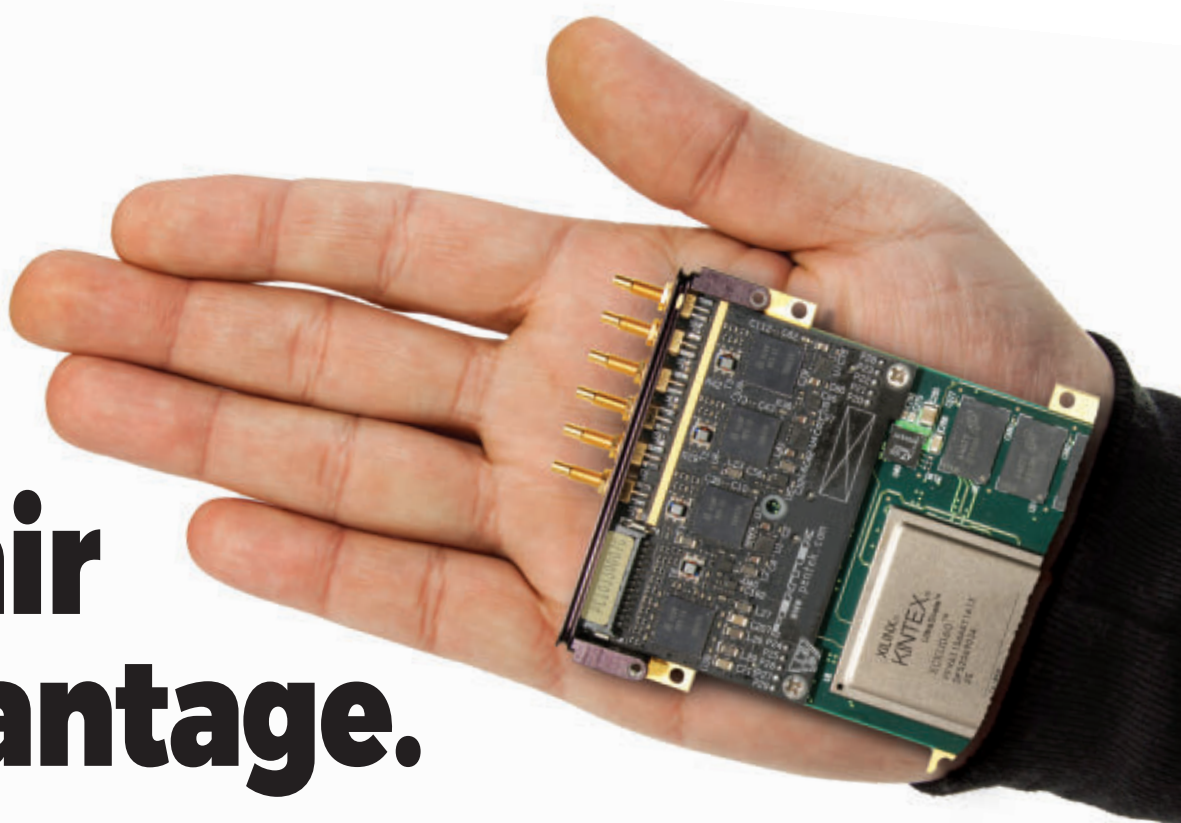
In a huge breakthrough for unmanned systems, in April the Navy christened a 132-foot-long, 145-ton unmanned ship named Sea Hunter, developed by Leidos Inc., funded by the Defense Advanced Research Projects Agency through DARPA's antisubmarine warfare continuous trail unmanned vessel initiative. The vessel is required to deploy 60 to 90 days without maintenance or human control. DARPA approved the Leidos design in 2014.

Sea Hunter is powered by twin MTU diesel engines and twin Caterpillar diesel generators, for a maximum speed of 26 knots.

During testing, the ship transited the 35 miles between Biloxi and Pascagoula, Miss., using only its autonomous navigation system. The Office of Naval Research took over management of the program from DARPA in January.

Speaking at the Sea Hunter christening in April, then-Deputy Defense Secretary Robert Work said, "how often can you be at the christening of a robot warship... you're going to look back at this day like when the Nautilus was christened... and say, 'I was part of history.'" ◀

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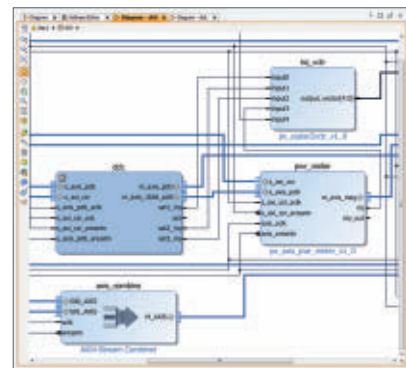
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SFF embedded computing for C4ISR

Modern missions on new and legacy military vehicles demand capable embedded computing systems and components in small form factors.

BY Courtney E. Howard

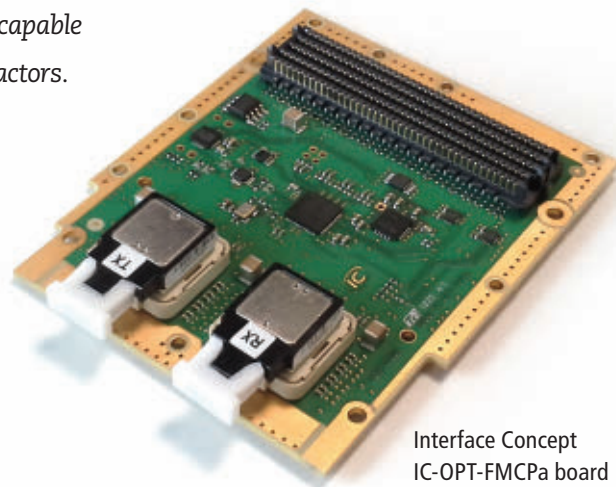
Aerospace and defense engineers are under considerable pressure to design and develop, integrate, and upgrade embedded computing systems such that they deliver ever greater capabilities in ever smaller sizes. Modern embedded computing advances enable engineers to pack robust processing power in full-featured small-form-factor (SFF) systems — and aerospace and defense program managers and end users are anxious to benefit from such innovations.

Space is at a premium in all aerospace and defense vehicles; new platforms are more compact than ever before, and legacy platforms are being infused with more and more systems, capabilities, and functionality. A marked increase in command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) missions, conducted with these vehicles, is driving the demand for SFF embedded computers.

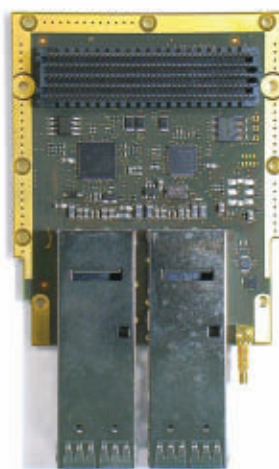
The ability to gather, process, share, and store intelligence, surveillance, and reconnaissance (ISR) data — including text, imagery, and video — is critical for real-time informed decision making, mission success, situational awareness, and safety. SFF embedded computing plays a large role in bringing these robust compute capabilities, features, and functionality to the field in ever smaller packages.

Platforms shrinking

Looking at the big picture in aerospace and defense, “we’re starting to see consolidation of platforms that are traditionally expensive to maintain. They are starting to shrink in size, primarily because of the logistics associated with maintaining the platforms; the cost is high, so there is a push to make the platforms more cost-effective,” says Jim Shaw, executive vice president of engineering at rugged computing specialist Crystal Group in Hiawatha, Iowa.



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Interface Concept
IC-QSFP-FMCPa module

For example, applications that historically employed “C-130s are going down to something like a Bombardier Dash 8 or a Cessna Citation. The platform size is becoming smaller, so the tube is smaller; there’s less area to get content or capabilities into that tube which is, by necessity, driving the industry to seek small-form-factor solutions.

“We’re seeing some shift in interest away from rack-mount servers to embedded, SFF, lightweight, and extremely small size,” Shaw continues. “We follow the Intel Roadmap, so we use a lot of embedded boards that are extremely small in size, and we’re seeing that footprint shrink with a focus on products under 10 pounds in weight.”

Crystal Group’s RE1401 NUC rugged embedded computer — measuring 4.8 by 6.3 by 1.9 inches — is a reflection of that trend toward extremely compact packages, Shaw says. Aerospace customers seek even smaller embedded computers for a growing number of applications, however. “It’s driving in that direction. In fact, we’re seeing a lot of interest in system on chip (SoC) applications. It’s really

taking all the content in a CPU and motherboard and turning into mostly a CPU with all the features pushed into that silicon.”

The move toward ever smaller and more powerful embedded computers in shrinking platform sizes provokes other systems-integration challenges. “Power and thermal are just as much of an issue. As a product gets smaller, there’s less area to dissipate the heat; you have to be innovative and it requires a certain amount of system engineering,” Shaw says. “In embedded computing, you’ve got big die and small boards; you have to be careful about how you package them so there are no issues with shock, vibe, and crash.”

Consolidation

The sizes of embedded computing systems and components becomes so important based on what designers are putting them into: very tight spaces in fixed-wing and rotary-wing aircraft, light armored vehicles, and unmanned aircraft systems (UAS), says Aneesh Kothari, director of marketing at Systel in Alpharetta, Ga. “Space is at a premium, and systems need to be size, weight, and power (SWaP)-optimized — as small as possible but still incredibly high performance, which lends to interesting thermal design challenges.”

Crystal Group, Systel, and other embedded computing companies are witnessing and delivering systems to facilitate greater hardware consolidation; they are supplanting several systems with hybrid or hyperconverged solutions. Replacing multiple big boxes with

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a single SFF embedded system, a growing trend, promises such benefits as cost and space savings.

“Defense customers are shifting from standalone systems to all-in-one embedded systems,” System’s

Kothari explains. “What has been the case in the past is one computer doing processing, another handling storage. An embedded all-in-one approach combines video capture, processing, and storage in one



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package — which from a SWaP, cabling, line-replaceable unit (LRU) failure, vendor management and support, and price perspective is much more desirable.

“It’s a trend we’re seeing across the board: a single LRU vs. multiple systems. Now technology is at a level where an all-in-one box can eliminate four other boxes,” Kothari says. As an example, Systel’s EB7001 rugged SFF video capture system provides video processing, compute, encoding, and storage in one LRU.

Systel’s EB7001 rugged SFF video capture system is deployed in airborne ISR applications to enhance situational awareness and for more effective target detection. The ISR work flow captures several high-definition (HD) video streams, brings them in from the sensor payload, and encodes them to the H.264 standard.

“Onboard exploitation is accomplished through the central processing unit (CPU), allowing the user to run the mission maps with synchronized metadata,” Kothari describes. “Users can interrogate the encoded

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video and create intelligent products. The video is presented

on dual displays onboard the vehicle and is distributed via various radio formats and networks to command-and-control centers. Video is also recorded and securely stored on solid-state drives (SSDs) for further review and analysis.”

Many systems using SFF embedded computing components are airborne, ranging from manned aircraft cabins to unpressurized compartments, helicopter equipment bays, and unmanned vehicles, says Rodger Hosking, vice president of embedded computing specialist Pentek Inc. in Upper Saddle River, N.J.

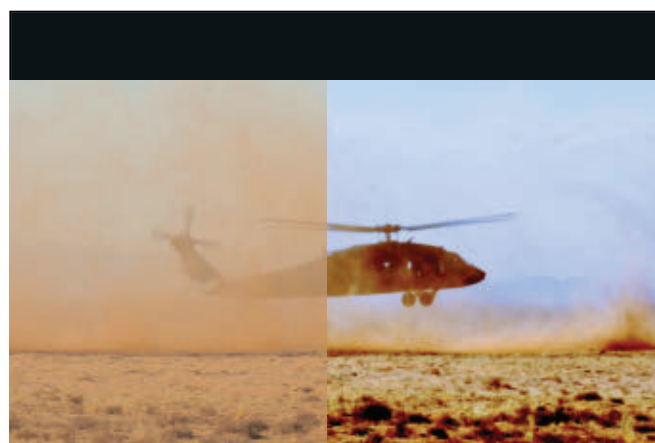
“We are seeing numerous requests for SFF systems and for board-level products that are integrated into SFF systems,” Hosking says. “Most of the applications we see require software radio signal acquisition, digital signal processing, and signal generation for communications, radar, and countermeasures.”

Programs using Pentek SFF systems and board-level products include: airborne radar electronic warfare (EW) transponders; small, ruggedized wideband radio-frequency (RF) signal acquisition and recording systems; and SIGINT surveillance subsystems for unmanned aircraft. “SFF acquisition systems located near antennas and sensors can digitize signals and then deliver them over optical cables to processing systems, dramatically reducing the weight, size, cost, bandwidth restrictions, and signal degradation of copper cables,” Hosking says.

Modularity and miniaturization

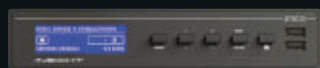
Demand for SFF embedded solutions is coming from applications ranging from missile defense systems and combat vehicle upgrades to aircraft modernization and new unmanned ground, air, and underwater platforms, says Mike Southworth, product manager at Curtiss-Wright Defense Solutions in Salt Lake City.

“Customer interest is piqued by the modularity and miniaturization we’re achieving with rugged



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commercial off-the-shelf (COTS) multi-core processors, graphics, and networking technologies that come pre-validated to a host of MIL-STD and DO-160 test conditions,” Southworth adds. DO-160 is the Radio Technical Commission for Aeronautics (RTCA) standard for Environmental Conditions and Test Procedures for Airborne Equipment. “With a boost in performance yet a reduction in size, weight, power consumption, and cost (SWaP-C), these rugged COTS solutions significantly help system integrators to reduce, even eliminate, traditional program non-recurring engineering (NRE) cost and technical risk.”

SFF embedded systems intended as LRUs increasingly are moving to industrial computer-on-module (COM)-based form factors, such as COM Express, or stackable single-board computer architectures, like PCI Express/104, Southworth observes. “These mezzanine/stackable modules are not only cost effective, low power, and physically small, they allow systems based on them to take advantage of the latest high-performance PCI Express, Serial ATA (SATA), Ethernet, and graphics standards. I/O modules based on the even smaller Mini PCI Express standard are also increasingly hosted on system carrier boards in these SFF systems to support add-on, application-specific requirements, such as for legacy interfaces for MIL-STD-1553, CANBus, and ARINC 429.”

Defense platforms involved in C4ISR upgrade efforts routinely specify these SFF systems to improve situational awareness and add mission processing capabilities

to interface with vehicle and aircraft sensors, data links, and other on-board LRUs, Southworth says.

Unmanned aircraft modules

An unnamed developer of unmanned aircraft required a rugged mission management computer for an optionally piloted airborne platform’s mission system architecture, which featured capabilities for simultaneous real-time data collection from several ISR and com-



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munications sensor payloads. The integrator for the advanced intelligence gathering air system sought a robust processor subsystem to interface with the various on-board payloads and mission subsystems, including electro-optic and signals intelligence (SIGINT) sensors, avionics and communications systems, Ethernet switches, situational awareness video cameras/encoders, and network attached storage (NAS) devices.

“This device would interrogate the installed sensors and automatically configure the on-board software to manage the [sensor] payload without human intervention,” Southworth explains. The platform integrator specified high-performance computing requirements, but was especially sensitive to SWaP considerations. “This translated into the mission management

computer LRU needing to support the latest multi-core Intel Core i7 processing capabilities together with a high number of interfaces to the many payload, video, network, and input/output (I/O) devices that would be required for various potential manned or unmanned system configurations.”

Curtiss-Wright’s Parvus DuraCOR mission computer system proved suitable given its rugged, compact and modular design. “The unit’s Intel Core i7-based quad-core processor provided the level of performance that the customer sought, and the open-architecture modularity enabled the relevant I/O, video, and network modules to be pre-integrated at the factory for a turnkey solution,” Southworth says.

A modified COTS variant of the subsystem was integrated using rugged off-the-shelf, mini-PCI Express and PCI Express/104 modules, including: dual-redundant MIL-STD-1553 and ARINC 429 data bus interfaces, several Gigabit Ethernet network interface cards (NICs), and opto-isolated digital input/outputs. The system was also equipped with an AMD Radeon graphics processing unit (GPU) card with 3D graphics engine support for Microsoft DirectX 11 and 576 gigaflops of peak single-precision, floating-point performance. It added three additional high-definition video interfaces to the system, for a total of six, and the ability to perform general-purpose graphics processing unit (GPGPU) parallel computing.

“This integrated GPU functionality helped to consolidate aircraft LRUs, eliminating the need for a separate laptop computer for the

pilot to view moving map information, since this could now be done through the mission management processor LRU," Southworth says. "A one-slot, removable, 2.5-inch, solid-state disk add-on segment, capable of hosting high-capacity, solid-state media, was also integrated to support removable mission data storage requirements."

The customer can deploy an integrated ISR mission processor subsystem tailored to the needs of the advanced ISR aircraft's mission system architecture, Southworth notes. "Thanks to the modularity of the subsystem architecture, the processor integrates a high number of network, video, serial, avionics, and other digital inputs/outputs tailored to support the various manned or unmanned ISR mission requirements of the platform. The customer can realize the platform's full potential, interfacing with installed sensors and auto-configuring mission software to manage the payload sensors."

"Engineers developing systems for military and aerospace programs should consider the technical, schedule, and cost advantages that leveraging rugged COTS modular subsystem technology from trusted partners can provide to fulfill contracts faster, more profitably, and with the best technically acceptable solution," Southworth advises.

Legacy upgrades

The embedded industry will move toward SFF module-based solutions on a 3U/6U baseboard for legacy systems, with the baseboard providing the required backplane interface, predicts Joe Eicher, director of global business development at www.militaryaerospace.com

Kontron America's Defense division in Poway, Calif. SFF module-based systems provide added "rugged shock-and-vibration protection at a system level, rather than with the individual boards that make up the system," he says. "Using a modular SFF approach also has benefits that

apply to scalability and obsolescence management."

Kontron's COM Express module-based Cobalt compact mission computer has been deployed in ground mobile, unmanned vehicle, and rotary-wing applications that require standardized and

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cost-effective high-performance computing coupled with a flexible and rugged SFF system.

“Helping to cut costs and speed designs, Cobalt offers a pre-integrated series of known and established system profiles that include a storage, situational awareness, and switch-stacked server profile,” Eicher says. “Customers see the value in application-ready SFF systems that offer upgradable, rugged options allowing them to leverage the attributes of a carrier board approach with the flexibility of mezzanine options, enabling them to remain competitive in this tough market.”

A growing number of SWaP-constrained applications are driving greater demand for multi-core SFF embedded computing systems, Eicher explains. “Defense system developers see these platforms as much more economical than the traditional 3U and 6U system solutions, enabling them to meet tighter budgets. They also provide versatility at the board level, allowing mil/aero OEMs to streamline designs of custom layouts for components and connectors.”

Building blocks

Engineers at Hughes Defense and Intelligence Systems Division (DISD) in Germantown, Md., set out to develop a small, sophisticated satellite communications (SATCOM) solution for ISR operations that could perform under a wide range of conditions, bandwidth challenges, and difficult terrain. The HM200 ruggedized mobile modem is designed to deliver high data throughput for beyond-line-of-sight (BLoS) common-the-move (COTM) applications

in a compact, low-power design for use across land, sea, and airborne platforms. Engineers opted to integrate the Hughes HM200 subsystem and specialized antenna connectors into Kontron’s Cobalt SFF embedded computing platform.



Curtiss-Wright Defense Solutions offers its DuraCOR 80-41 Intel Core i7 mission computer.

Kontron engineers customized the company’s COTS Cobalt 901 to match Hughes DISD’s SATCOM system requirements. Kontron’s sealed and validated IP67 embedded computer system offered Hughes engineers a wide selection of processor, storage, power, and interface options, as well as a small terminal footprint optimized for performance, harsh environments, and reduced SWaP — top priorities for Hughes to meet end user requirements.

“Adding capabilities and equipment into the same footprint presents a great challenge for developers, yet is frequently a requirement in mobile and portable system upgrades,” Kontron officials say. Cobalt’s scalable and modular open-standard features, integrated into a small form factor, facilitate upgrades.

The HM200 is an integrated solution providing a constant, reliable feed of critical real-time information to support a wide range of military operations, including: ISR, border patrol, search and rescue, disaster response, wildfire monitoring, oil platform communications, cellular backhaul, and airborne platforms. As an open-architecture COTS solution, it can be readily installed into a wide range of manned and unmanned, fixed- or rotary-wing platforms to deliver video, voice, and data capabilities, officials say.

“Kontron’s Cobalt system ideally and cost-effectively met our needs for a scalable integrated building block architecture,” says Wayne Marhefka, senior director of business development at Hughes DISD.

“Implementing new mobile broadband technology is critical for real-time situational awareness and ISR capabilities that keep military personnel one step ahead,” officials say.

Slow SFF adoption

Aerospace and defense vehicles and systems are shrinking in size, certainly, but widespread adoption of SFF embedded computers has yet to be realized. Some industry veterans speculate that ancillary technologies are slowing SFF progression in mil/aero applications.

“As the electronics and packaging become more integrated and smaller, it’s the external, real-world 38999 I/O connectors and the human factors (MIL-STD-1472) that are forcing SFF physical sizes to be much larger than they could be if defined by the size of the electronics by itself,” says Doug Patterson, vice president of marketing and business development

at Aitech Defense Systems in Chatsworth, Calif. The MIL-STD-1472F Department of Defense Design Criteria Standard: Human Engineering establishes human engineering criteria for the design and development of military systems, equipment, and facilities.

"The problem today is that no one will pay to upgrade a platform and replace all the connector harnesses, too. That's unrealistic, so SFF with other than the standard 38999 connectors is relegated to new program starts only, and those are like hen's teeth," Patterson says.

Demand for SFF embedded systems has increased exponentially among aerospace and defense customers across the board, especially for ISR applications, Systel's Kothari says. Video plays a more important role than ever in C4ISR applications, as real-time video and data have become critical for mission success, he adds.

"There is an imperative for 'eyes on the target' throughout the entire command ecosystem, which has led to increased demand for high-quality, low-latency, full motion video by military leadership," Kothari explains. Greater use of standard-definition (SD) and high-definition (HD) cameras has made video capture and encoding vital to missions conducted on numerous platforms in which space is at a premium and SWaP constraints are a vital consideration, he says. "SFF embedded systems can offer high-performance computing in a rugged, small package while still meeting military requirements for use in harsh environments, including a wide spectrum of operating temperatures, shock and vibration,

www.militaryaerospace.com

electromagnetic interference/electromagnetic compatibility (EMI/EMC), dust, and water ingress protection."

A modular approach to SFF embedded computing also benefits video ISR systems and applications. "Utilizing high-speed PCI Express lanes in a modular, stackable fashion

allows for highly customizable and powerful SFF solutions," Kothari says. "For extremely space-constrained platforms and applications, such as unmanned vehicles, PC/104 systems have been replaced by newer COM Express form factor boards and systems. COM Express

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allows for greater I/O flexibility and is more capable of handling the ever-increasing computing and graphics demands of the modern military. Another advantage, COM Express allows system integrators such as Systel to buy off-the-shelf CPU/chipset/memory technology and embed it into embedded products without worrying about chipset-level design. We can customize carrier boards to suit the application.”

System designers and integrators are adopting a hybrid approach, “combining these types of standards to create highly customized and flexible systems for specific applications,” Kothari says. “The application requirements are driving the overall system-level design without being hampered by rigid board-level architecture.”

AI and FPGAs

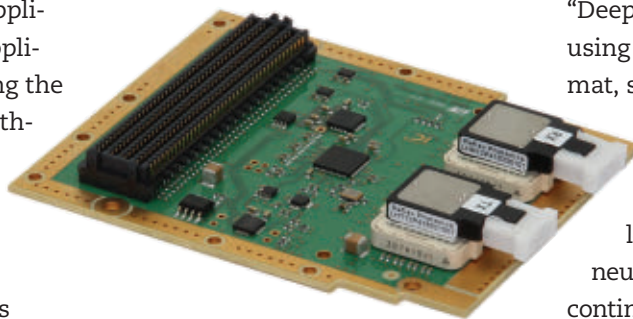
The demand for SFF systems is increasing, yet continues to be fragmented and specialized, observes Dennis Smith, vice president of engineering at Themis Computer in Fremont, Calif.

“Defense computing is moving more toward the edge, requiring form factors to become smaller and increase in performance. ISR, personal radar, and soldier-level communications will drive adoption in increasing numbers, while military application-specific requirements will keep the market specialized and fragmented,” Smith anticipates.

In fact, a wide variety of aerospace and defense applications employ Themis SFF systems, Smith describes. The Joint Light Tactical Vehicle (JLTV) uses Themis Computer’s NanoSwitch 10- or 16-port tactical switch compliant with

the Vehicular Integration for C4ISR/ EW Interoperability (VICTORY) standard. The company’s NanoPak SFF computer is being used in smart displays that control Army electrical generators in unmanned aerial vehicle (UAV) ground stations, while its NanoPak i7 is employed in personal radar and vehicle tracking systems.

Sensor fusion, aided by machine learning, is a key application area for SFF embedded computers. Machine learning, a type of artificial intelligence (AI) in which software algorithms iteratively learn from expo-



Interface Concept’s IC-OPT-FMCPa VITA 57.1 FMC is equipped with two optical modules.

sure to data and automate data analysis, is helping aerospace and defense organizations glean critical information, such as target identification, from ever-increasing data stores.

AI is being used to provide greater soldier-level decision support, requiring “not only high compute capability but also localized storage,” Smith says. “Soldiers are requiring robots to take on increased responsibilities in the battlefield, such as front-end support for hazard avoidance, intelligence gathering, and in some instances combat engagement. Autonomous operation is being investigated for applications in both land and air-based vehicles. Some of

these applications require increased processing clock speed, while others utilize multi-core features and need higher core count.”

Customers have expressed interest in using field-programmable gate arrays (FPGAs) for increasing performance beyond a standard processor, Smith says. “FPGAs come in a variety of power and performance levels that suit integration into SFF systems,” typically used for radar, SIGINT, software-defined radio, video processing, and AI.

Deep learning with GPGPUs

“Deep Learning Neural Networks using GPGPUs in small-format, self-contained enclosures are all the rage,” insists Aitech’s Patterson.

Computing based on deep learning models the brain’s neural learning process to enable continuous learning, increased intelligence over time, and more accurate and faster results. GPGPUs excel at visual, image, and graphics output, using hundreds of cores to process several image data elements simultaneously; they combine well with deep learning to help users understand “what an image is, how to identify it, and how to move forward,” Patterson describes. It fills a “market need for image processing — for object detection, tracking, classification, and threat assessment.”

With so much high-resolution data being collected, limited compute power can prove detrimental in the field. Computer hardware must be able to keep pace with modern sensors; such limitations can cause users to “dumb down” sensors and could slow the real-time response essential in battlefield scenarios,

Patterson cautions. "Use GPGPUs to avoid the pitfalls; parallel processing is the way to go.

"Sensor platforms contained within medium to large UAS, tactical ground vehicles, remote chemical detection and warning sensor trailers, C4ISR audio and video processing, homeland security, and border monitoring are only a small sampling of potential applications for high-performance GPGPU modules," Patterson says. GPGPU-based SFF embedded computers can also cut remote mission display computer size, weight, and cost on manned and unmanned helicopter and UAS platforms, he adds.

"There is certainly an evident trend to save weight and to try to minimize the size of the systems," says Thierry Wastiaux, senior vice president of sales at Interface Concept in Paris. "That being said, aerospace and defense customers will not compromise the safety and reliability of the systems.

"They will not take high risks to go for small form factors," Wastiaux continues. If the SFF embedded computing system uses unreliable connectors, for instance, they will not accept it. COM Express connectors, he says, do not support vibrations and temperatures well and "they are not suited for harsh environment applications.

"In many cases, customers will still need high computing power especially in radar and EW systems. In this case, high-end processors and FPGAs have to be used to ensure reaching the high-level performance of a new system with a competitive edge on the market," Wastiaux

explains. "These high-performance components emit heat that must be safely extracted from the boards and systems. This can be a limiting factor to reduce size and weight."

In fact, many SFF fanless computer box designers have to limit



The Systel EB7001 is a rugged, SFF embedded video capture and encoding system.

the processing power of their systems to be able to extract the heat from the processors, Wastiaux says. "If you want several processors in parallel, separate SFF fanless boxes will not be a good solution because a lot of space and weight will be lost."

A solution, Wastiaux says, lies in the OpenVPX VITA standard, which "is exactly defined to reach a good compromise between reliability and size. For instance, 3U OpenVPX can be considered as a relatively small form factor appearing to be the best approach that is used by many defense applications."

Interface Concept has won contracts for 3U OpenVPX processor and switch boards for safety-critical systems on UAS programs led by defense primes, Wastiaux explains. Company engineers extensively use the VITA 57 small form factor for signal acquisition and optical communication in systems.

A VITA 57 standard FPGA mezzanine card (FMC) is a small

mezzanine card format dedicated to signal acquisition and data transfers that is plugged on a FPGA carrier board and allows high-data throughput and very low latency. "All that is required is swapping out the FMC module and adjusting the FPGA firmware," Wastiaux says. "This standard can also be used for data communication, electrical or optical." In the case of Interface Concept's IC-OPT-FMCPa module, optical communication at rates up to 28 gigabits per second (Gb/s) are achieved with Reflex Photonics transceivers, he explains.

The future of SFF

The demand for SFF is still in its infancy given that there are no universally adopted, open systems standards for SFF in the embedded market yet, Aitech's Patterson says. "Customer interest will increase only if the functionality contained within the SFF meets the application space claim and overall functionality at a cost-effective price. Small embedded, backplane-based 3U subsystems are still fitting the needs."

SFF embedded computing technology will, nonetheless, continue to advance, and pique the interest of myriad aerospace and defense engineers. "Innovation will continue to fuel further reductions in SWaP, while delivering more performance and functionality than ever before, and at a lower acquisition cost," predicts Southworth at Curtiss-Wright Defense Solutions, which he says "will continue to leverage next-generation advanced processor, graphics, and networking technologies to solve customer problems and enable new capabilities for the warfighter." ◀

► Raytheon to upgrade Taiwan missile-defense surveillance radar

Missile defense experts at the Raytheon Co. will upgrade a long-range surveillance radar system in Taiwan. The current radar system has been in operation since early 2013 to help warn the island country of attacks from neighboring mainland China. Officials of the U.S. Air Force Life Cycle Management Center at Hanscom Air Force Base, Mass., announced a \$26.2 million contract to the Raytheon Integrated Defense Systems segment in Woburn, Mass., to upgrade the Taiwan Early Warning Radar Surveillance Radar system that sits atop Le Shan Mountain, Taiwan. Raytheon will upgrade the Taiwan missile warning system to address obsolescence concerns. The Taiwan early-warning radar is a surplus U.S. Raytheon AN/FPS-115 PAVE Phased Array Warning System (PAVE PAWS) radar sold to Taiwan in 2000 and activated in 2013. Raytheon engineers developed the AN/FPS-115 PAVE PAWS radar originally in the 1970s to detect and track incoming missile threats, particularly submarine-launched ballistic missiles. Much of the 40-year-old technology in this radar is obsolescent and needs upgrading. ◀

BAE Systems to build electronic warfare systems to protect special-ops planes

BY John Keller

ROBINS AIR FORCE BASE, Ga. — Electronic warfare (EW) experts at BAE Systems will provide RF countermeasures systems to help U.S. special-operations C-130J turbo-prop aircraft evade and jam enemy radar systems.

Officials of the U.S. Air Force Life Cycle Management Center at Robins Air Force Base, Ga., have announced a \$67.7 million order to the BAE Systems Electronic Systems segment in Nashua, N.H., to provide radio frequency (RF) countermeasures systems for special operations C-130J four-engine turbo-prop aircraft.

The aircraft involved are the AC-130J Ghost rider close-air-support plane and the MC-130J Commando II, which is designed to fly covertly at night for Special Forces refueling, infiltration, exfiltration, and resupply.

This order calls for BAE Systems to design, build, and test airborne EW systems to enable special-operations C-130J aircraft to detect, identify, locate, deny, degrade, disrupt, and defeat enemy radar systems during special-operations missions.

In addition to BAE Systems, the Northrop Grumman Corp. Mission Systems segment in Linthicum, Md., is developing EW systems for the AC-130J and MC-130J aircraft. The two companies could split as much as \$400 million over the life of this program.



Low-flying Special Operations aircraft will receive enhanced electronic warfare capability to protect them from enemy radar.

The AC-130J Ghost rider's primary missions are close air support, air interdiction, and armed reconnaissance. Close air support missions include troops in contact, convoy escort, and point air defense. The Ghost rider carries a 105-millimeter cannon, 30-millimeter cannon, as well as smart munitions like the GBU-39 Small-Diameter Bomb and the AGM-176 Griffin missile.

The MC-130J Commando II performs clandestine, or low-visibility air refueling missions for special operations helicopters and tiltrotor aircraft, and infiltration, exfiltration, and resupply of special operations forces. The Commando II primarily flies missions at night to reduce probability of visual acquisition and intercept by enemy aircraft and air defenses. Its secondary mission includes the airdrop of leaflets.

BAE Systems will do the work in Nashua, N.H., and should be finished by August 2023. ◀

FOR MORE INFORMATION visit BAE Systems Electronic Systems online at www.baesystems.com.



UNMANNED vehicles

QinetiQ targets unmanned aerial targets with acquisition of Meggitt division

Executives of defense electronics specialist QinetiQ in Farnborough, England, are boosting the company's expertise in military unmanned aerial target systems with their acquisition of Meggitt Target Systems Ltd. in Ashford, England. The deal, worth 57.5 million British pounds sterling (about \$71.3 million), comprises Meggitt Defense Systems Limited in Ashford, England, and Meggitt Holdings Canada Inc. in Medicine Hat, Alberta. Together these two entities make up Meggitt Target Systems, an international provider of unmanned aerial, naval, and land-based targets and services for test, evaluation, training, and mission rehearsal. The company provides targets to about 40 countries, and performs on-site target services in 15 of those countries. Meggitt Target Systems will form part of QinetiQ's new International business unit within QinetiQ's Global Products division in Ashford, England. QinetiQ officials say the acquisition opens new routes to market to accelerate QinetiQ's international growth; adds several customer relationships in Europe, Asia, and North America; and establishes design and manufacture capabilities in Canada. ➔

Unmanned vehicles among most promising opportunities for embedded computing

BY John Keller

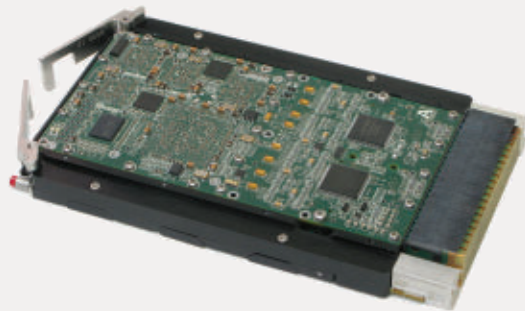
NEW ORLEANS — Unmanned aircraft, unmanned ground vehicles (UGVs), and unmanned sea vehicles will see substantial growth over the next decade, and are prime candidates for embedded computing, says Brian Arbuckle, senior market analyst at IHS Markit in London.

From now until 2026, 63,000 new unmanned aerial vehicles (UAVs) will be built for global military forces, 30,000 military unmanned ground vehicles with extended mission endurance in hostile environments will be built, and about 2,000 unmanned sea vehicles will be provided to global militaries, Arbuckle says.

For embedded computing suppliers, unmanned vehicle radar signal processing, electronic warfare (EW), and signals intelligence applications will be bright spots for design-ins of single-board computers, small-form-factor embedded computing systems, and other embedded computing technologies. Yet, questions remain to be answered before suppliers can be assured of these kinds of promising market opportunities, particularly with a new U.S. president.

"The big question will be what will the new administration do with defense spending," Arbuckle adds. Recent studies project U.S. defense spending to remain flat at about \$600 billion annually from 2015 to 2021 — well past Trump's first term in office.

"The Trump factor is a risk factor



to this forecast," Arbuckle explains. "Will there be policy changes to increase defense spending? I suspect there will be. Is NATO obsolete? What's going to happen? I couldn't even guess."

For embedded computing suppliers over the next decade, military and industrial-control applications will represent the most promising markets, Arbuckle says. For embedded computing form factors, Arbuckle expects applications growth in 6U and 3U VPX embedded computing design-ins, while traditional VME applications will see contraction. Additional embedded computing market growth over the next 10 years will occur in computer-on-module (COM) architectures, as well as in standard single-board computers.

Poor growth is expected in applications of the xTCA subset of Advanced Telecommunications Computing Architecture (ATCA) in embedded computing involving physics applications over the next decade, Arbuckle says. "The xTCA market really is collapsing, as equipment manufacturers are going to a software-centric approach," he says. ➔

Airborne Laser Mine Detection System takes next step to deployment

The U.S. Navy's AN/AES-1 Airborne Laser Mine Detection System (ALMDS), designed and manufactured by Northrop Grumman Corp., is taking another step toward deployment, as the Navy announced initial operational capability (IOC) in January. ALMDS provides rapid wide-area reconnaissance and assessment of mine threats in sea lanes, littoral zones, confined straits, choke points and amphibious areas of operations. Northrop Grumman will continue perfecting the system, which will be considered deployable when Navy officials give it full operational capability. The ALMDS uses a sensor pod to sweep the water rapidly using laser technology. The sensor pod also can be installed rapidly on a medium-lift helicopter and quickly removed after the mission.

Air Force considers laser weapons to defend B-52 jet bombers

Researchers at the U.S. Air Force Research Laboratory are working on experimental demonstrator laser weapons able to bolt-on to an aircraft like the B-52 long-range jet bomber. Scientists are working to arm the B-52 with defensive laser weapons able to destroy or disable air-to-air or air-to-ground missile attacks. The five-year Self-Protect High Energy Laser Demonstrator program is intended to create sufficient onboard power, optics, and high-energy lasers to defend large military planes like the B-52 bomber, currently undergoing a series of high-tech upgrades. ◀

Army searches industry for state-of-the-art imaging LIDAR for tactical mapping from UAVs

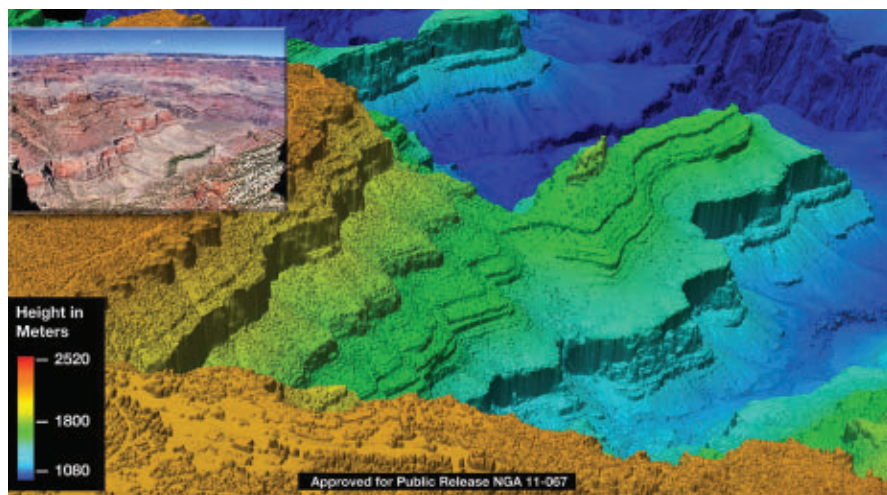
BY John Keller

FORT BELVOIR, Va. — U.S. Army electro-optics researchers are scouring industry to find the most advanced light detection and ranging (LIDAR) systems to perform tactical mapping from unmanned aerial vehicles (UAVs).

Officials of the Army Contracting Command have issued a source-

tems for tactical mapping, mission planning, and target detection using multi-aspect foliage penetration (FOPEN) technology. Of particular interest is LIDAR technology mature enough for an advanced technology demonstrator prototype.

Army researchers are looking for LIDAR systems that consist of several line-replaceable units (LRUs),



The U.S. Army is trying to find light detection and ranging (LIDAR) systems small enough for unmanned aircraft.

sought notice (W909MY-17-R-A006) for the LIDAR Payload for Manned and Unmanned Airborne Platforms project. Army Contracting Command officials are issuing this notice on behalf of the Army Communications –Electronics Research, Development and Engineering Center (CERDEC) – Night Vision and Electronic Sensors Directorate (NVESD) at Fort Belvoir, Va.

This project seeks to determine the state-of-the-art in LIDAR sys-

including an imaging sensor, data storage, and sensor processing.

The imaging sensor must have a pointing and stabilization unit, such as a stabilized turret, that houses the sensor optics, focal planes, and supporting electronics. The data storage and sensor processing portion includes a computer, data storage, sensor-processing algorithms, and imaging sensor command and control software.

The LIDAR imaging sensor should offer resolution of 30 centimeters

from altitudes of at least 18,000 feet above ground level, with point rates of 500,000 to 6.5 million final-product points per second. It should have a variable swath from 200 meters or less to 1 kilometer or more, with slant ranges of 25,000 feet.

Because this sensor will be mounted to an unmanned aircraft, low weight and aerodynamic drag are major considerations. Re-

searchers want systems that weigh between 200 and 300 pounds, and that measure 18 to 21 inches in diameter.

Software should include automated feature extraction and aided target recognition algorithms for anomaly detection, segmentation, void detection, plane detection, other features to minimize analyst workload, and limited-bandwidth

communications of less than two megabits per second.

Companies interested should e-mail responses to the Army's Hanh Dinh at hanh.t.dinh.civ@mail.mil. E-mail questions or concerns to the Army's Rosetta Wisdom-Russell at rosetta.wisdom-russell.civ@mail.mil. ◀

MORE INFORMATION IS online at <http://bit.ly/2mfTUyv>.

BAE Systems to provide new head-up display for F-22 jet fighter avionics

ROCHESTER, England — Military avionics designers at Lockheed Martin Corp. needed upgraded head-up display (HUD) technology for the U.S. Air Force F-22 Raptor jet fighter. They found their solution from the BAE Systems Electronic Systems segment in Rochester, England.

Officials of the Lockheed Martin Aeronautics segment in Fort Worth, Texas, have chosen BAE Systems to modernize the F-22's HUD by replacing it with a completely digital version, BAE Systems officials say.

BAE Systems engineers will use the company's advanced Digital Light Engine (DLE) technology to implement a form, fit, and function HUD solution that integrates seamlessly into the F-22's existing HUD space.

BAE Systems officials say they expect to receive a follow-on production contract from Lockheed Martin to retrofit the current HUDs in the Air Force F-22 fleet with the modern DLE solution.

The DLE package is compatible with any existing aircraft interface. The upgrade removes the conventional cathode ray tube (CRT) image source and introduces a more advanced digital display,



which offers increased reliability, eliminates high-maintenance and obsolete items, and provides a constant luminance performance.

DLE technology provides enhanced situational awareness for the military aviator, and allows some freedom of head movement.

DLE HUD technology is backward-compatible with existing aircraft interface, and offers minimal impact on display performance, company officials say.

As an increasing number of military aircraft receive upgrades to digital display solutions, the DLE HUD offers easy integration into existing HUD space, BAE Systems officials say. It offers more than 20 percent life-cycle cost reduction and at least four times greater mean time between failure (MTBF), experts say.

"The F-22 is a premier fighter aircraft of the U.S. Air Force, and its pilots deserve the most advanced situational awareness technology available today," says Andy Humphries, director of advanced displays at BAE Systems. "We've worked closely with Lockheed Martin to deliver a completely modernized HUD solution for the F-22 fleet that meets the long-term needs of the Air Force." ◀

FOR MORE INFORMATION visit BAE Systems Electronic Systems online at www.baesystems.com, Lockheed Martin Aeronautics at www.lockheedmartin.com/us/aeronautics.html, or the Air Force Life Cycle Management Center at www.wpafb.af.mil/aflcmc.

PRODUCT applications

AIRCRAFT SOFTWARE

Lockheed Martin to provide cybersecurity for Navy C-130T aircraft

Avionics software experts at Lockheed Martin Corp. are taking measures to provide data integrity and cybersecurity for the U.S. Navy's fleet of 20 C-130T Hercules cargo, logistics, and utility aircraft.

Officials of the Naval Air Systems Command at Patuxent River Naval Air Station, Md., announced a \$16.1 million contract modification to the Lockheed Martin Rotary and Mission Systems segment in Owego, N.Y., for data integrity in the Avionics Obsolescence Upgrade (AOU) effort on the C-130T aircraft.

Since 2012, Lockheed Martin has been installing, upgrading, and maintaining an avionics and software integration solution to upgrade Navy C-130T aircraft under the AOU program.

The effort includes modernizing the C-130T's communication suite, flight management system, cockpit displays, navigation computers, autopilot, and automatic flight control system with an integrated, modular open systems approach (MOSA), by adhering to the Future Airborne Capability Environment (FACE) standard.

Data integrity, a subset of



cybersecurity, involves maintaining and assuring the accuracy and consistency of data over its life cycle as a system stores, processes, or retrieves data. It seeks to prevent the loss or corruption of important data by malicious or accidental means.

The C-130T AOU upgrade includes government-furnished color weather radar; UHF, VHF, and HF radios; embedded global positioning system (GPS) and inertial navigation systems; protected instrument landing system (P-ILS), and standby instruments for use with Lockheed Martin-furnished avionics and software.

On this order Lockheed Martin will do the work in Ottawa and in Owego, N.Y., and should be finished by March 2018.

FOR MORE INFORMATION visit **Lockheed Martin Rotary and Mission Systems** online at www.lockheedmartin.com/us/rms.html, or **Naval Air Systems Command** at www.navair.navy.mil.



CYBERSECURITY

Raytheon to provide cyber security for military secure voice communications

Cybersecurity experts at the Raytheon Co. will provide up-to-date cryptographic capabilities for military secure voice communications under terms of a \$459 million, five-year U.S. Air Force contract.

Officials of the U.S. Air Force Life Cycle Management Center at Joint Base San Antonio, Texas, are asking Raytheon information security experts in Fort Wayne, Ind., to provide full-rate production of National Security Agency (NSA)-certified encryption for U.S. Department of Defense (DOD) secure voice communications.

The secure communications systems involved in this contract are the Advanced Narrowband Digital Voice Terminal (ANDVT) and the VINSON family of voice encryption devices. Together, these two devices are part of the VINSON ANDVT Cryptographic Modernization program, otherwise known as VACM.

The VACM End Cryptographic Unit (ECU) is to maintain function and capability of the existing VINSON and ANDVT ECUs with NSA Type 1 encryption — specifically the NSA classified Suite A SAVILLE encryption algorithm, as well as 16-kilobit-per-second continuously variable slope delta modulation (CVSD) audio compression.

The VACM program seeks to replace legacy cryptographic units to provide tactical secure voice on UHF and VHF line-of-sight radios and UHF satellite communications (SATCOM) tactical phone systems. These terminals provide classified as well as unclassified military communications.

The ANDVT is a secure voice terminal for low-bandwidth secure voice communications throughout the U.S. military. Devices in the ANDVT family include the AN/USC-43 Tactical Terminal (TACTERM); the KY-99A Miniaturized Terminal (MINTERM); and the KY-100 Airborne Terminal (AIRTERM).

In addition to the ANDVT, VINSON is embedded into modern military radios like the Single-Channel Ground and Airborne Radio System (SINGARS). Some multi-algorithm communications security modules also are backward-compatible with VINSON.

On this contract Raytheon will do the work in Fort Wayne, Ind., and Largo, Fla., and should be finished by December 2021.

FOR MORE INFORMATION visit **Raytheon** online at www.raytheon.com.

INFORMATION TECHNOLOGY

Four companies to provide cyber and information education and training

U.S. Navy cybersecurity experts are asking four companies to provide cyber and information technology (IT) training for the U.S. Marine Corps Forces Cyber Command at Fort Meade, Md.

The four companies will provide cyber and IT training in support of the Marine Corps Forces Cyber Command, including basic- and

intermediate-level courses, opportunity-level courses, opportunity areas from Pipeline 2.2, and other software applications.

The four companies are RavenTek in Chantilly, Va.; Onyx Consulting Services LLC in Columbia, Md.; CSR Group in Crownsville, Md.; and Ultimate Knowledge Corp. in Scottsdale, Ariz.

RavenTek's contract is worth at least \$19.2 million and with options could be as large as \$31.1 million. Onyx's contract is worth at least \$14.6 million and with options could be as large as \$24.1 million. CSR Group's contract is worth at least \$14.2 million and with options could be as large as \$23.1 million. Ultimate Knowledge's contract is worth at least \$21.8 million.

These four companies will provide commercially available technical courses at the national level for the organizations that support Marine Corps cybersecurity missions, Navy officials say.

The four companies will compete for task orders over the next three years. Each three-year contract has two one-year options.

FOR MORE INFORMATION visit **RavenTek** online at <http://raventek.com>.

TEST AND MEASUREMENT

Korea Aerospace chooses Marvin MTS-209 test set for Thai T-50TH jet trainer

Test and measurement experts at Korea Aerospace Industries (KAI) in Sacheon, South Korea, needed a portable test set for the KAI/Lockheed Martin T-50TH combat aircraft trainer being sold to the Thai air force. They found their solution from Marvin Test Solutions in Irvine, Calif.

KAI officials are choosing the MTS-209 common armament test set from Marvin Test Solutions as part of the support package for a group of T-50TH aircraft purchased by the Thai air force to replace aging Thai L-39 Albatros trainers.

The Thai T-50TH aircraft, which should be delivered to the Thai air force over the next two years, was developed by KAI and Lockheed Martin as a multi-role trainer. The aircraft has several variants, including a light combat aircraft, which is capable of supersonic speeds.



The Marvin Test Solutions MTS-209, also called the Stores Suspension Unit Tester (SSUT), is a portable test set for various armament systems used on the F-16, F-15, F/A-18, T-50, TA-50, FA-50, Hawk, and additional aircraft, officials say.

The MTS-209 supports a range of alternate mission equipment (AME) such as missile launchers, aircraft pylons, and bomb racks. Marvin experts based the new system on the company's MTS-207 rugged field test.

The MTS-209 combines the test capabilities of an I-Level backshop test set in a compact, rugged, flightline-qualified enclosure. The test set's modular design simplifies logistics, and its flexible, scalable PXI architecture enables future upgradeability to match evolving test requirements. ←

FOR MORE INFORMATION visit **Marvin Test Solutions** online at www.marvintest.com.



CONNECTORS

LEMO offers watertight connectors for aircraft, vehicles, wearable electronics

LEMO USA in Rohnert Park, Calif., is introducing design changes to the company's T series, watertight (IP68) connectors for military, security, aircraft test and measurement, and medical applications. The outer shell design changed to LEMO's standard look, and the



connector now has three latches vs. two latches. Applications include aircraft communications, land vehicles, night-vision equipment, simulation or personal battle equipment, test and measurement, and other industries wherever the environmental conditions require ruggedized equipment. The T series connectors are small sized watertight connectors using the same original LEMO push-pull technology. Based on the LEMO B series, the T series includes a special construction with an inner-sleeve and extra sealing to enable IP68 water protection. The T series is available in 2-to-9-contact configurations. Contacts can be terminated by soldering to the wire, crimping onto the wire, or directly

to a PCB. A keying system ensures correct connector alignment and the connector outer shell offers EMI shielding.

FOR MORE INFORMATION visit **LEMO USA** online at www.lemo.com.

RUGGED COMPUTERS

Small-form-factor computer for avionics and vetronics introduced by Curtiss-Wright

The Curtiss-Wright Corp. Defense Solutions Division is introducing the Parvus DuraCOR 312 ultra-small-form-factor mission computer for civil and military ground vehicles, fixed-wing aircraft and helicopters, maritime vessels, and command-and-control embedded computing applications. The Parvus DuraCOR 312 delivers high-performance embedded computing (HPEC) and general-purpose graphics processing for compute-intensive applications such as intelligence, surveillance, reconnaissance, electronic warfare, targeting, and deep learning. The unit weighs about 1.5 pounds, measures 1.4 by 5.2 by 5.4 inches,



and runs on 30 watts of power. Based on the NVIDIA Jetson Tegra X1 (TX1) supercomputer-on-module, the rugged DuraCOR 312 is for small size, weight, and power (SWaP) applications like avionics and vetronics. The unit combines

the TX1's quad-core 64-bit ARM Cortex-A57 (ARMv8) processor and 256 Maxwell/CUDA-core GPU with a set of base I/O that includes Ethernet, serial, USB, DIO, and video ports. Its miniature rugged chassis, which has military-grade connectors, meets MIL-STD-810G, MIL-STD-461F, MIL-STD-1275D, MIL-STD-704F, and RTCA/DO-160G environmental, power, and EMI specifications for high-altitude, wide-temperature, humid, extreme shock and vibration, and noisy electrical environments.

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

TEST AND MEASUREMENT

Digital multimeters with USB interfaces introduced by Saelig



Saelig Co. in Fairport, N.Y., is introducing the 1908 and 1908P digital multimeters (DMMs) with USB and other optional interfaces for high-resolution, dual-measurement benchtop test and measurement applications. Additional features include frequency, capacitance, and temperature measurements, as well as math and data logging. These DMMs include internal rechargeable batteries, so the meters will function on location. When precision

measurements are required, hand-held portable multimeters may not be sufficient for the task. The portable 1908 and 1908P DMMs have a USB interface for remote control and read-back, while the 1908P device adds RS232, GPIB, and LXI-compliant LAN interfaces. The DMMs feature two displays for showing different parameters simultaneously. Quick-response auto-ranging for measurement parameters ensures the best possible resolution with optional manual ranging.

FOR MORE INFORMATION visit Saelig Co. online at www.saelig.com.

CABLES AND CONNECTORS

Flame retardant tubing for cabling and connectors introduced by TE

TE Connectivity in Menlo Park, Calif., is introducing the single wall, flame retardant (SWFR) product line for fire-proofing cabling and connectors in confined spaces. These single-wall heat shrink tubing products are



rated for the UL VW-1 flammability test specified by the UL 224 standard. Because the flame-retardant polyolefin jacket is non-halogenated, SWFR tubing can be used in confined-space applications where it is unacceptable for materials containing halogen to burn and potentially emit toxins. SWFR tubing products come in either thin wall (X2) or very thin wall (X4) versions. The products shrink at a 2:1 ratio and install quickly, due to their relatively low full-recovery temperature of 90 degrees Celsius. Both types of tubing products are very flexible and can

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be used across operating temperatures ranging from minus 30 degrees Celsius to 125 degrees Celsius.

FOR MORE INFORMATION visit **TE Connectivity** online at www.te.com.

BOARD PRODUCTS

3U OpenVPX embedded computing power supply introduced by Dawn VME

Dawn VME Products in Fremont, Calif., is introducing the PSC-6238 VITA 62-compliant 3U OpenVPX embedded computing power supply for rugged unmanned land, sea, and airborne mission-critical applications. The PSC-6238 offers power to 800 watts for conduction-cooled

systems, is embedded with rugged system health monitor (RuSH) technology, provides precision monitoring and control, and can operate in military environments over a wide range of temperatures at high power levels. The power electronics device offers resistance to the effects of shock and vibration per MIL-STD-810F and has an onboard



real-time clock with switchable battleshort and nuclear event detect functions. Dawn's PSC-6238 is a wedge lock, conduction-cooled module on a 1-inch pitch with an operating temperature of -400 to 850 degrees Celsius at the wedge lock edge. The 800-watt output, 6-channel supply is current/load share compatible with as many as four PSC-6238 units. The PSC-6238 front I/O panel includes a 3-color LED status indicator, VBAT battery access, and a USB port for status display, access menu control, and firmware upgrade. ◀

FOR MORE INFORMATION visit Dawn VME online at www.dawnvme.com.

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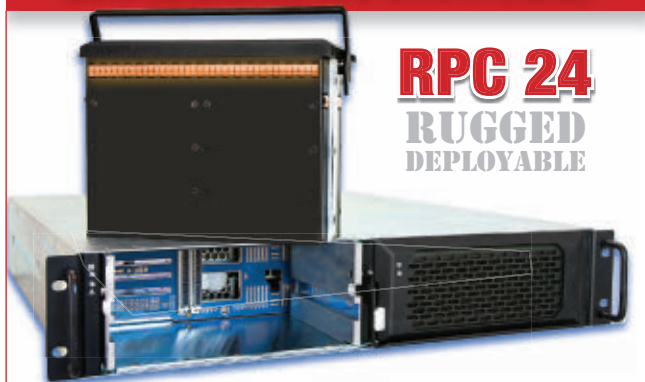
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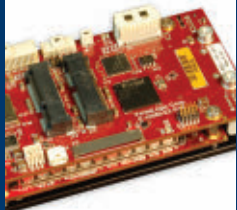
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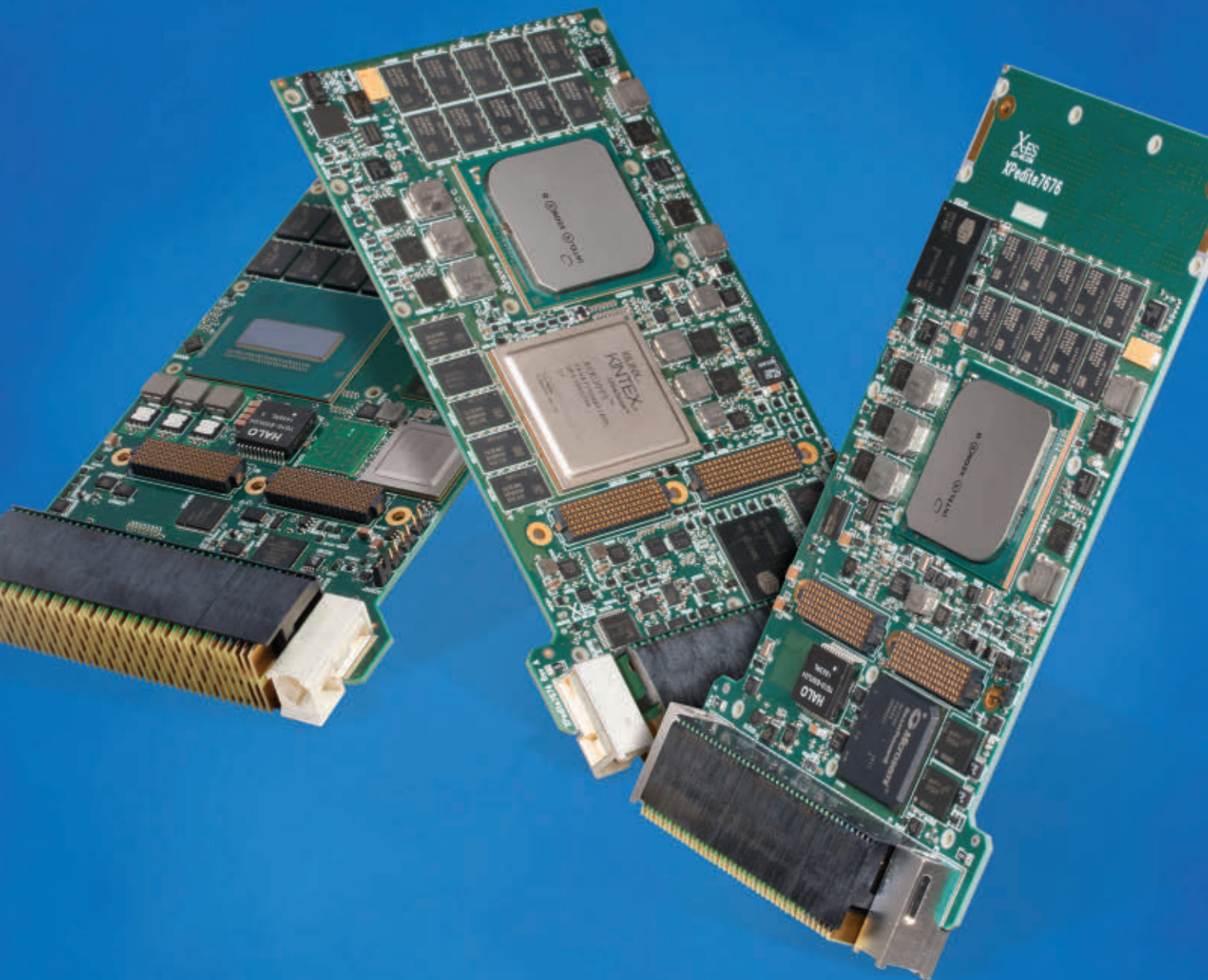
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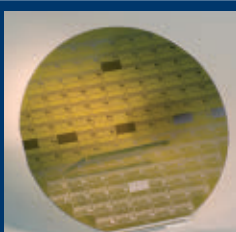
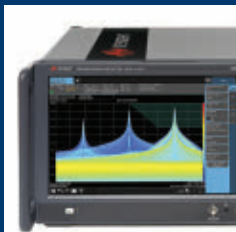
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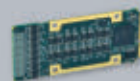
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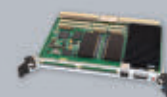
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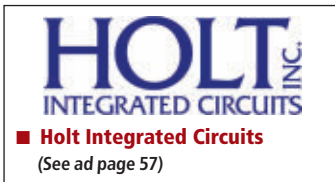
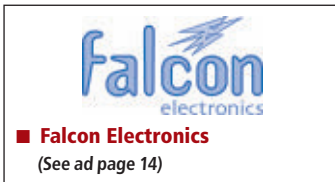
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BEEcube Inc, a National

Instruments Co

Century Electronics

Chassis Plans

Clear-Com

Comtech TCS SSD

■ Crystal Group Inc

(See ad inside front cover)

Daisy Data Displays Inc

Dawn VME Products

Dedicated Computing

■ ECRIN Systems

(See ad page 12)

EDT | Engineering Design Team Inc

■ Elma Electronic Inc

(See ad page 29)

esd electronics Inc

GDCA Inc

IBI Systems Inc

Kontron

Microway Inc

Modular Industrial Computer Inc

MPL AG

NextComputing

■ Pentek Inc

(See ad page 21)

Radisys

■ Systel Rugged Computers

(See ad page 27)

TEN TECH LLC

■ Themis Computer

(See ad page 47)

Trenton Systems Inc

Vadatech Inc

■ ZMicro Inc

(See ad page 24)

SERVERS

ACCES I/O Products

American Portwell Technology

Atrenne Integrated Solutions

Chassis Plans

CHI Cos

Cleanroom Connection Inc

Clear-Com

Comtech TCS SSD

Cornet Technology Inc

■ Crystal Group Inc

(See ad inside front cover)

Dedicated Computing

■ ECRIN Systems

(See ad page 12)

EDT | Engineering Design Team Inc

Foremay

General Micro Systems Inc

Kontron

■ Mercury Systems

(See ad page 25)

Microway Inc

Red Rapids

■ Systel Rugged Computers

(See ad page 27)

■ Themis Computer

(See ad page 47)

Trenton Systems Inc

■ ZMicro Inc

(See ad page 24)

SPECIALIZED COMPUTERS

- TEMPEST

Aitech Defense Systems Inc

Atrenne Integrated Solutions

BEEcube Inc, a National

Instruments Co

Chassis Plans

Comtech TCS SSD

Foremay

Mobile Desk/Mobile Office Solutions

MPL AG

Orion Technologies LLC

■ Systel Rugged Computers

(See ad page 27)

WEARABLE COMPUTERS

Comtech TCS SSD

■ Crystal Group Inc

(See ad inside front cover)

Foremay

General Dynamics C4 Systems

Ironwood Electronics

Mobile Desk/Mobile Office Solutions

■ Themis Computer

(See ad page 47)

■ VersaLogic Corp

(See ad page 48)

DIAGNOSTICS AND CONTROL

AVIONICS HEALTH MANAGEMENT

Alphi Technology

■ Applied Avionics Inc

(See ad page 55)

Astronics Ballard Technology

Dawn VME Products

SpaceAge Control Inc

Sporian Microsystems Inc

CLOCKS/TIMERS

■ Applied Avionics Inc

(See ad page 55)

Masterclock Inc

RWC Testing & Lab Supplies

ENGINE CONTROLS

American Industrial Repair

CERTON

dSPACE Inc

■ Gaia Converter

(See ad page 19)

Ironwood Electronics

PulseTech Products Corp

Sporian Microsystems Inc

UTC Aerospace Systems

ENGINE MONITORING

Alphi Technology

Crane Aerospace & Electronics

EMCOR Government Services

Omega Engineering Inc

PCE Instruments UK Ltd

Photron USA Inc

PulseTech Products Corp

Sporian Microsystems Inc

FUEL MANAGEMENT SYSTEMS

Crane Aerospace & Electronics

First Sensor Inc

Tef Cap Industries

HEALTH AND USAGE MONITORING (HUMS)

Dawn VME Products

EMCOR Government Services

Impact Technical Services Ltd

Sporian Microsystems Inc

Versatile Power

ICE DETECTION

SpaceAge Control Inc

OVERHEAT DETECTION

Dawn VME Products

MoviTHERM

PCE Instruments UK Ltd

Sporian Microsystems Inc

Tef Cap Industries

ELECTRO-OPTICS

BONDING AND ADHESIVES

Alpha Assembly Solutions

Berliner Glas KGaA Herbert

Kubatz GmbH & Co

Electrolube

Finetech

First Sensor Inc

Henniker Plasma

Master Bond

■ R&D Interconnect Solutions

(See ad page 17)

Sealing Devices Inc

SHENMAO America Inc

Teichsil Ltd

CAMERAS

Active Silicon Inc

Active Silicon Ltd

Carr Quality Assurance Consulting

elnfochips

EO Strategies

First Sensor Inc

■ Gaia Converter

(See ad page 19)

General Atomics Aeronautical Systems Inc

GEVICAM Inc

Guernsey Coating Laboratories Inc

IO Industries Inc

IRCameras LLC

ISVI Corp

Kowa American Corp

Laser Physics UK Ltd

Lenthor Engineering Inc

Lockheed Martin Santa

Barbara Focal Plane

Matrox Imaging

MoviTHERM

Phase 1 Technology Corp

Princeton Infrared

Technologies Inc (PIRT)

Sensors Unlimited Products

Sierra-Olympic Technologies

Inc (SOTI)

Sierra Pacific Innovations

TEN TECH LLC

TNC Optics & Technologies Pte Ltd

Toshiba Imaging Systems Div

Video Scope International Ltd

Vision Components GmbH

West Coast Tech Ltd

ELECTRO-OPTIC MATERIALS AND SUBSTRATES

AdTech Ceramics
Cleanroom Connection Inc
DeWAL Industries
EO Strategies
GigOptix Inc
II-VI Inc
Infinite Optics Inc
Logitech Ltd
Luna Optoelectronics
PG&O - Precision Glass & Optics
Reynard Corp
SENER
SHENMAO America Inc
Vision Components GmbH
West Coast Tech Ltd

EQUIPMENT MANUFACTURING

Blue Wolf
Coherent Solutions
Computer Conversions Corp
Finetech
Integrated Dispensing Solutions Inc
OptoTest Corp
Princeton Infrared Technologies Inc (PIRT)
Sierra-Olympic Technologies Inc (SOTI)

FORWARD-LOOKING INFRARED SYSTEMS

EO Strategies
Lenthor Engineering Inc
Meggit Defense Systems
Princeton Infrared Technologies Inc (PIRT)
Sensors Unlimited Products
Sierra-Olympic Technologies Inc (SOTI)
West Coast Tech Ltd

LASER COMPONENTS

AdTech Ceramics
Avo Photonics
Carr Quality Assurance Consulting
Cleanroom Connection Inc
Coherent Inc
DILAS Diode Laser Inc
Electro-Optical Products Corp

■ Evans Capacitor Co

(See ad page 6)

Excelitas Canada

■ Falcon Electronics

(See ad page 14)

Frankfurt Laser Co
Go4Fiber Ltd
II-VI Inc
Infinite Optics Inc
Krell Technologies Inc
Kugler of America Ltd
Laser Physics UK Ltd
Lasertel
Lenox Laser
Logitech Ltd
LPKF Laser & Electronics
Lumetrics Inc

MegaWatt Lasers Inc
Micro Laser Systems Inc
OSI Laser Diode Inc
OZ Optics Ltd
Passat Ltd
Qualmark Corp
Reynard Corp
RPMC Lasers Inc
SENER
TeraXion Inc
TNC Optics & Technologies Pte Ltd
Visotek Inc
Wavelength Electronics Inc
West Coast Tech Ltd

LASERS

Avo Photonics
Carr Quality Assurance Consulting
Cleanroom Connection Inc
Coherent Inc
Coherent Solutions
DILAS Diode Laser Inc
DRS Technologies Inc
EO Strategies
Excelitas Canada
Frankfurt Laser Co
General Atomics Aeronautical Systems Inc
Guernsey Coating Laboratories Inc
II-VI Inc
Keopsys SA
Krell Technologies Inc
LAS-CAD GmbH
Laser Physics UK Ltd
Lasertel
LEA Photonics
Logitech Ltd
LPKF Laser & Electronics
MegaWatt Lasers Inc
Micro Laser Systems Inc
Newport Corp
OFS
OSI Laser Diode Inc
OZ Optics Ltd
Passat Ltd
Princeton Lightwave Inc
RPMC Lasers Inc
SENER
SPI Lasers UK Ltd
SurplusEQ.com
TeraXion Inc
TNC Optics & Technologies Pte Ltd
West Coast Tech Ltd

Guernsey Coating Laboratories Inc
II-VI Inc
Keopsys SA
Krell Technologies Inc
LAS-CAD GmbH
Laser Physics UK Ltd
Lasertel
LEA Photonics
Logitech Ltd
LPKF Laser & Electronics
MegaWatt Lasers Inc
Micro Laser Systems Inc
Newport Corp
OFS

OSI Laser Diode Inc
OZ Optics Ltd
Passat Ltd
Princeton Lightwave Inc
RPMC Lasers Inc
SENER
SPI Lasers UK Ltd
SurplusEQ.com
TeraXion Inc
TNC Optics & Technologies Pte Ltd
West Coast Tech Ltd

LEDs

American Opto Plus LED Corp

■ Applied Avionics Inc

(See ad page 55)

Blue Wolf
Carr Quality Assurance Consulting
Cleanroom Connection Inc
Electrolube

■ Elma Electronic Inc

(See ad page 29)

Excelitas Canada

■ Falcon Electronics

(See ad page 14)

FoxFury Lighting Solutions
Frankfurt Laser Co
G-S PLASTIC OPTICS
II-VI Inc
Konica Minolta Sensing Americas Inc
Lambda Research Corp
Logitech Ltd
Luna Optoelectronics
MAZeT GmbH
Microsemi Corp
Opto Diode Corp
OSI Laser Diode Inc
OSI OptoElectronics Inc
RPMC Lasers Inc
SHENMAO America Inc
StacoSystems
TTI Inc
VCC

■ Wilbrecht LEDCO Inc

(See ad page 54)

LIGHTING

Aero Dynamix Inc
American Opto Plus LED Corp



FoxFury Lighting Solutions
Guernsey Coating Laboratories Inc
Infinite Optics Inc
Konica Minolta Sensing Americas Inc
Luna Optoelectronics
MAZeT GmbH
Nightstick
Phase 1 Technology Corp
Qualmark Corp
Reynard Corp
Sealing Devices Inc
TNC Optics & Technologies Pte Ltd
VCC
Versatile Power

NIGHT VISION

Active Silicon Inc
Advanced Night Visions Systems Inc (ANVS)
Aero Dynamix Inc
American Opto Plus LED Corp

■ Applied Avionics Inc

(See ad page 55)

Archer Optx
BE Meyers & Co Inc



Elbit Systems of America
EO Strategies

■ Gaia Converter

(See ad page 19)

G-S PLASTIC OPTICS
Guernsey Coating Laboratories Inc
Infinite Optics Inc
IRCameras LLC
Konica Minolta Sensing Americas Inc
Kowa American Corp
Lasertel
Lensei Optics Pvt Ltd
Lenthor Engineering Inc
Luna Optoelectronics
MoviTHERM
Phase 1 Technology Corp
Princeton Infrared Technologies Inc (PIRT)
Reynard Corp
Sensors Unlimited Products
Sierra-Olympic Technologies Inc (SOTI)

Sierra Pacific Innovations

SwissOptic AG

Thermoteknix Systems Ltd

TNC Optics & Technologies Pte Ltd

Video Scope International Ltd

West Coast Tech Ltd

■ Wilbrecht LEDCO Inc

(See ad page 54)

OPTICAL AMPLIFIERS

Advanced Photonix Inc
Analog Devices Inc
II-VI Inc
Keopsys SA
LEA Photonics
Luna Optoelectronics
Molex - Optical Solutions Group
Opto Diode Corp
OSI OptoElectronics Inc
OZ Optics Ltd
Reynard Corp
RPMC Lasers Inc
Specialised Imaging Inc
Specialised Imaging Ltd

OPTICAL COATINGS/TREATMENTS

Archer Optx
Deposition Sciences Inc (DSI)
Electrolube
Eureka Dry Tech
G-S PLASTIC OPTICS
Guernsey Coating Laboratories Inc
II-VI Inc
Infinite Optics Inc
Kowa American Corp
Logitech Ltd
Lumetrics Inc
Master Bond
OSI OptoElectronics Inc
OZ Optics Ltd
PG&O - Precision Glass & Optics
Reynard Corp
Specialty Coating Systems
Sterling Precision Optics Inc
SwissOptic AG

West Coast Tech Ltd
Westech Optical Corp

OPTICAL DETECTORS

Advanced Photonix Inc
DRS Technologies Inc
Excelitas Canada

■ Falcon Electronics

(See ad page 14)

First Sensor Inc
G-S PLASTIC OPTICS
Guernsey Coating Laboratories Inc
Kowa American Corp
Logitech Ltd
Luna Optoelectronics
MAZeT GmbH
Microsemi Corp
Opto Diode Corp
OSI Laser Diode Inc
OSI Optoelectronics Inc
Photron USA Inc
Princeton Infrared
Technologies Inc (PIRT)
Princeton Lightwave Inc
Radiant Vision Systems
Sensors Unlimited Products
Sierra-Olympic Technologies Inc (SOTI)
Specialised Imaging Inc
Specialised Imaging Ltd
Thermo Scientific - CIDTEC
TNC Optics & Technologies Pte Ltd
Toshiba Imaging Systems Div
Video Scope International Ltd

OPTICAL FIBER

Archer OpTx
Corning Optical Communications
Delphi Automotive LLP
Excelitas Canada
Go4Fiber Ltd
Guernsey Coating Laboratories Inc
II-VI Inc
Infinite Optics Inc
InnovaQuartz LLC

■ Interstate Connecting Components

(See ad inside back cover)

Krell Technologies Inc
KVH Industries Inc
L-com Global Connectivity
Logitech Ltd
Micro Laser Systems Inc
Noramco Wire & Cable
OFS
Photon Control Inc
Rennsteig Tools Inc
TE Connectivity
TNC Optics & Technologies Pte Ltd

OPTICAL FILTERS

Archer OpTx
Deposition Sciences Inc (DSI)
DiCon Fiberoptics Inc
Guernsey Coating Laboratories Inc
II-VI Inc
Infinite Optics Inc

Logitech Ltd
MAZeT GmbH
Newport Corp
OZ Optics Ltd
PG&O - Precision Glass & Optics
Reynard Corp
Sterling Precision Optics Inc
TeraXion Inc
TNC Optics & Technologies Pte Ltd
West Coast Tech Ltd

OPTICAL IMAGING

Active Silicon Inc
Archer OpTx
DRS Technologies Inc
Electro-Optical Products Corp
EO Strategies
Fiberscope.net
Fibersense & Signals Inc
GEVICAM Inc
G-S PLASTIC OPTICS
Guernsey Coating Laboratories Inc
H&L Instruments LLC
Infinite Optics Inc
Iscon Inc
ISVI Corp
Keo Scientific Ltd
KEYENCE Corp of America
Kowa American Corp
Lambda Research Corp
Logitech Ltd
Photron USA Inc
Princeton Infrared
Technologies Inc (PIRT)
Radiant Vision Systems
Reynard Corp
SENER
Sensors Unlimited Products
Shoghi Communications
Sierra-Olympic Technologies Inc (SOTI)
Specialised Imaging Inc
Specialised Imaging Ltd
Sting Ray Optics LLC
TNC Optics & Technologies Pte Ltd
Toshiba Imaging Systems Div
Video Scope International Ltd
West Coast Tech Ltd
Westech Optical Corp

OPTICAL SWITCHES



Coherent Solutions
Cornet Technology Inc
DiCon Fiberoptics Inc
■ **Falcon Electronics**
(See ad page 14)
Fibersense & Signals Inc
Liteway Inc
Luna Optoelectronics

OptoTest Corp
OSI Optoelectronics Inc
OZ Optics Ltd
Pickering Interfaces Inc
■ **R&D Interconnect Solutions**
(See ad page 17)

StacoSystems
SurplusEQ.com

OPTICAL TRANSCEIVERS

Applied Optoelectronics Inc
H&L Instruments LLC

■ Interstate Connecting Components

(See ad inside back cover)

Molex - Optical Solutions Group
■ **R&D Interconnect Solutions**
(See ad page 17)
Tektronix Component Solutions
Teledyne Microelectronics
TeraXion Inc
TXO Systems Ltd

OPTICS

Archer OpTx
Avo Photonics
Berliner Glas KGaA Herbert
Kubatz GmbH & Co
Carr Quality Assurance Consulting
Cleanroom Connection Inc
Deposition Sciences Inc (DSI)
DRS Technologies Inc
EO Strategies
Eureka Dry Tech
Frankfurt Laser Co
G-S PLASTIC OPTICS
Guernsey Coating Laboratories Inc
II-VI Inc
Infinite Optics Inc
InnovaQuartz LLC
IRCameras LLC
ISVI Corp
Kowa American Corp
Krell Technologies Inc
Kugler of America Ltd
Lambda Research Corp
LAS-CAD GmbH
Laser Physics UK Ltd
Lense Optics Pvt Ltd
Logitech Ltd
Micro Laser Systems Inc
Newport Corp
PG&O - Precision Glass & Optics
Photon Control Inc
Radiant Vision Systems
Reynard Corp
Sensors Unlimited Products
Sierra-Olympic Technologies Inc (SOTI)
Sterling Precision Optics Inc
Sting Ray Optics LLC
SurplusEQ.com
SwissOptic AG
TE Connectivity
TNC Optics & Technologies Pte Ltd
UTC Aerospace Systems

Visotek Inc
West Coast Tech Ltd
Westech Optical Corp
WL Gore & Associates

THERMAL IMAGING

Active Silicon Inc
Advanced Test Equipment Rentals
Archer OpTx
EO Strategies
Excelitas Canada
Guernsey Coating Laboratories Inc
II-VI Inc
Infinite Optics Inc
IRCameras LLC
Kowa American Corp
Lenthor Engineering Inc
MoviTHERM
PCE Instruments UK Ltd
Phase 1 Technology Corp
Princeton Infrared
Technologies Inc (PIRT)
Raytheon Vision Systems
Reynard Corp
Sensors Unlimited Products
Sierra-Olympic Technologies Inc (SOTI)
Sierra Pacific Innovations
Sting Ray Optics LLC
Thermoteknix Systems Ltd
Wavelength Electronics Inc
West Coast Tech Ltd

ULTRAVIOLET LIGHT SOURCES

American Opto Plus LED Corp
Blue Wolf
Coherent Inc
FoxFury Lighting Solutions
Frankfurt Laser Co
Micro Laser Systems Inc
Nightstick
Passat Ltd
Photon Control Inc
Reynard Corp
SurplusEQ.com
Techsil Ltd

■ Wilbrecht LEDCO Inc

(See ad page 54)

NAVIGATION

AUTOMATIC DEPENDENT SURVEILLANCE-BROADCAST (ADS-B) EQUIPMENT

■ Applied Avionics Inc

(See ad page 55)

Carr Quality Assurance Consulting
Sealing Devices Inc
Shoghi Communications

GPS SYSTEMS

■ Applied Avionics Inc

(See ad page 55)

Ball Aerospace and
Technologies Corp
CERTON

General Micro Systems Inc
GPS Source Inc
Ironwood Electronics
KVH Industries Inc
Sealing Devices Inc
SENER
Shoghi Communications
Spectracom
Tango Wave
US Dynamics Corp

TERRAIN

■ Applied Avionics Inc

(See ad page 55)

KVH Industries Inc
Sealing Devices Inc

PLATFORM SYSTEMS/ SUBSYSTEMS

AUTOPILOTS

Jewell Instruments

AVIONICS



■ **Abaco Systems**
(See ad back cover)

ADL Embedded Solutions Inc



■ **Advanced Conversion Technology Inc**

Amphenol PCD
Annapolis Micro Systems Inc



■ **Applied Avionics Inc**
(See ad page 55)

Astronics Ballard Technology
Atrenne Integrated Solutions
Avionics Interface Technologies (AIT)
AvionTEq
AWT-Global LLC
Barco Federal Systems LLC



Blue Wolf

CERTON
Clear-Com
Coaxial Components Corp (Coaxicom)
Computer Conversions Corp

Comtech TCS SSD
Conscious Systems Engineering LLC
Crane Aerospace & Electronics
Curtiss-Wright Defense Solutions
Data Bus Products
Design Criteria Inc
Dynamic Engineering
EaglePicher Technologies LLC
eInfochips
EIZO Rugged Solutions
ELDEC

■ Elma Electronic Inc

(See ad page 29)

Essex Industries

■ Extreme Engineering Solutions Inc (X-ES)

(See ad page 3, 43)

■ Holt Integrated Circuits

(See ad page 57)

Honeywell Aerospace

■ Interface Concept

(See ad page 18)

Interpoint
Ironwood Electronics
Jewell Instruments
Kontron
Lenthor Engineering Inc
Meggitt Defense Systems
Merrimac
North Atlantic Industries Inc
Orion Technologies LLC
PartMiner Industries
PIC Wire & Cable
QSDM Inc
Rennsteig Tools Inc
Sandel Avionics
SENER
Sensitron Semiconductor
Shoghi Communications
Signal Technology
SpaceAge Control Inc
Speel Praha Ltd
StacoSystems
Statek Corp
TenCate Advanced Composites
TEN TECH LLC
Teradyne
US Dynamics Corp
UTC Aerospace Systems

CABIN MANAGEMENT SYSTEMS

Automated Motion
Blue Wolf
Conscious Systems Engineering LLC
eInfochips
Tef Cap Industries
UTC Aerospace Systems

COUNTERMEASURES

Advanced Conversion Technology Inc
Annapolis Micro Systems Inc
Century Electronics
CTT Inc
dB Control
Excelitas Technologies
Shoghi Communications

ELECTRONIC FLIGHT INSTRUMENT SYSTEMS (EFIS)

■ Gaia Converter

(See ad page 19)

TEN TECH LLC

LANDING SYSTEMS

PartMiner Industries
Qualmark Corp
UTC Aerospace Systems

LIGHTING

Aero Dynamix Inc



Blue Wolf

FoxFury Lighting Solutions
MAZeT GmbH
Nightstick
Qualmark Corp
UTC Aerospace Systems

LIGHT MANAGEMENT SYSTEMS

Blue Wolf
Design Criteria Inc
MAZeT GmbH
MoviTHERM
Nightstick
Radiant Vision Systems

NAVIGATION EQUIPMENT

Advanced Conversion Technology Inc
Atrenne Integrated Solutions
AWT-Global LLC
CERTON
CTT Inc
Dawn VME Products
KVH Industries Inc
Lenthor Engineering Inc
QSDM Inc
Qualmark Corp
Rockwell Collins
Sandel Avionics
SENER
Statek Corp

SATELLITE SYSTEMS

ADL Embedded Solutions Inc
Annapolis Micro Systems Inc
Berliner Glas KGaA Herbert
Kubatz GmbH & Co
Coaxial Components Corp (Coaxicom)
Computer Conversions Corp
EaglePicher Technologies LLC
Lenthor Engineering Inc
Pearson Machine Co LLC
Qualmark Corp
Shoghi Communications
Tango Wave
TEN TECH LLC
ViaSat Inc

SECURITY SYSTEMS

Active Silicon Inc
Active Silicon Ltd
ADL Embedded Solutions Inc
Coaxial Components Corp (Coaxicom)
Dspnor AS
■ **Innovative Integration**
(See ad page 23)
MoviTHERM
Shoghi Communications
Southwest Microwave

SHIPBOARD/MARITIME ELECTRONICS

Advanced Conversion Technology Inc
Aero Dynamix Inc
Analytic Systems
Annapolis Micro Systems Inc
■ **Applied Avionics Inc**
(See ad page 55)
Atrenne Integrated Solutions
Avionics Interface Technologies (AIT)
Blue Wolf
Century Electronics
Chassis Plans
Coaxial Components Corp (Coaxicom)
Computer Conversions Corp
Comtech TCS SSD
Crane Aerospace & Electronics
Dawn VME Products
Dspnor AS
Dynamic Engineering
EIZO Rugged Solutions
ELDEC
■ **Elma Electronic Inc**
(See ad page 29)
Interpoint
Kontron
KVH Industries Inc
L-com Global Connectivity
Merrimac
Modular Devices Inc
North Atlantic Industries Inc
Orion Technologies LLC
Pearson Machine Co LLC
■ **PICO Electronics Inc**
(See ad page 1, 7)

PIC Wire & Cable
QSDM Inc

■ RGB Spectrum

(See ad page 40)

SENER
Signal Technology
StacoSystems
Thermacore Inc
TSC
US Dynamics Corp
■ **VersaLogic Corp**
(See ad page 48)

TRAINING AND SIMULATION

Astronics Test Systems
Avionics Interface Technologies (AIT)
AWT-Global LLC
Barco Federal Systems LLC

Chassis Plans
Clear-Com
Dspnor AS
Lexycom Technologies Inc
Meggitt Defense Systems
North Atlantic Industries Inc
Orion Technologies LLC
PrismTech

■ **RGB Spectrum**
(See ad page 40)

Rockwell Collins
SENER
Shoghi Communications
Siemens PLM Software

UNMANNED VEHICLES

Active Silicon Inc
Active Silicon Ltd
ADL Embedded Solutions Inc
Advanced Conversion Technology Inc
Allied Motion Technologies Inc
Analytic Systems
Annapolis Micro Systems Inc
Atrenne Integrated Solutions
Barco Federal Systems LLC
BittWare
Blue Wolf
Century Electronics
Chassis Plans
Clear-Com
Comtech TCS SSD
Crane Aerospace & Electronics
CTT Inc
Design Criteria Inc
EaglePicher Technologies LLC
ELDEC

■ **Extreme Engineering Solutions Inc (X-ES)**
(See ad page 3, 43)

FLIR Systems Inc
Foremay

■ **Holt Integrated Circuits**
(See ad page 57)

Lenthor Engineering Inc
Lexycom Technologies Inc
North Atlantic Industries Inc
Orion Technologies LLC
PALMARII Dynamics AB
Pearson Machine Co LLC
Pelorus Naval Systems Inc
Phase 1 Technology Corp
PrismTech
Qualmark Corp
Sensitron Semiconductor
Shoghi Communications
SpaceAge Control Inc

VETRONICS



■ **Applied Avionics Inc**
(See ad page 55)

Astronics Ballard Technology
Atrenne Integrated Solutions
Barco Federal Systems LLC
Curtiss-Wright Defense Solutions

■ **Elma Electronic Inc**
(See ad page 29)

■ **Holt Integrated Circuits**
(See ad page 57)

Modular Devices Inc
North Atlantic Industries Inc
Orion Technologies LLC
Pleora Technologies Inc
Sensitron Semiconductor
Thermacore Inc

WEATHER SYSTEMS

PCE Instruments UK Ltd

WEIGHT AND BALANCE SYSTEMS

Impact Technical Services Ltd

RF AND MICROWAVE

AMPLIFIERS

Advanced Microwave Products
Advanced Test Equipment Rentals
Agile Microwave Technology Inc
Analog Devices Inc
Arrow Electronics Inc
Astronics Test Systems
AWT-Global LLC
CalibreRF Ltd
Carr Quality Assurance Consulting
Cleanroom Connection Inc
Computer Conversions Corp
Comtech PST
Continental Resources
CTT Inc
dB Control

■ **Falcon Electronics**
(See ad page 14)

GigOptix Inc
GPS Source Inc
Intersil
L-com Global Connectivity

■ **Mercury Systems**
(See ad page 25)

Merrimac
Microsemi Corp
Mouser Electronics
Mu-Del Electronics
NI Microwave Components

■ **Pasternack**
(See ad page 5, 11, 65)

Pickering Interfaces Inc
Sensitron Semiconductor
Signal Technology
Silicon Radar GmbH
Southwest Antennas
STMicronics Inc
Tamagawa Electronics Co Ltd

Tango Wave
TASC Technical & Assembly Services Corp
TriQuint Semiconductor
TSC
US Dynamics Corp

ANTENNAS

Advanced Test Equipment Rentals
AWT-Global LLC
CalibreRF Ltd
Cleanroom Connection Inc
Clear-Com
Cobham Antenna Systems
Computer Conversions Corp
GPS Source Inc

■ **Interstate Connecting Components**
(See ad inside back cover)

L-com Global Connectivity
MPB srl
Mu-Del Electronics
Radiency Technologies
Shakespeare Military Antenna Products
Southwest Antennas
Southwest Microwave
Streamline Circuits Corp
TE Connectivity
TenCate Advanced Composites
TSC
ViaSat Inc

BONDING AND ADHESIVES

Alpha Assembly Solutions
Boyd Corp
Electrolube
Finetech
Henniker Plasma
Master Bond

■ **R&D Interconnect Solutions**
(See ad page 17)

SHENMAO America Inc
Techsil Ltd

DIPLEXERS/MULTIPLEXERS

CalibreRF Ltd
Carr Quality Assurance Consulting
GPS Source Inc
NI Microwave Components
Pickering Interfaces Inc
Southwest Antennas
Tamagawa Electronics Co Ltd
Tango Wave
US Dynamics Corp

DISCRETE COMPONENTS

Boyd Corp
CalibreRF Ltd
Cobham Antenna Systems
Computer Conversions Corp
Crane Aerospace & Electronics
■ **Falcon Electronics**
(See ad page 14)
GPS Source Inc

IR HiRel - An Infineon Technologies Co
Microsemi Corp
Mouser Electronics

■ **Pasternack**
(See ad page 5, 11, 65)

■ **Positronic**
(See ad page 53)
Powell Electronics
SHENMAO America Inc
Space Electronics Ltd
TASC Technical & Assembly Services Corp
TE Connectivity
TTI Inc
Wavelength Electronics Inc

FILTERS

Amphenol Aerospace
Barry Industries Inc
CalibreRF Ltd
Cobham Antenna Systems
GPS Source Inc

■ **Interstate Connecting Components**
(See ad inside back cover)

Keysight Technology Inc
L-com Global Connectivity
March Electronics Inc
Merrimac
Mouser Electronics
MPB srl
Mu-Del Electronics
Quell Corp
Sealing Devices Inc
Signal Technology
Southwest Antennas
Tamagawa Electronics Co Ltd
Tektronix Component Solutions
TriQuint Semiconductor
TTI Inc
US Dynamics Corp

FREQUENCY SYNTHESIZERS

CalibreRF Ltd
Continental Resources
Crane Aerospace & Electronics
Merrimac
NI Microwave Components
Signal Technology
TallannQuest
Tamagawa Electronics Co Ltd
TASC Technical & Assembly Services Corp
TSC
US Dynamics Corp

HYBRIDS

Agile Microwave Technology Inc
CalibreRF Ltd
Cleanroom Connection Inc
Computer Conversions Corp
Luna Optoelectronics
Merrimac
NI Microwave Components
Signal Technology

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 TASC Technical & Assembly Services Corp
 Tektronix Component Solutions
 Teledyne Microelectronics

MICROWAVE SUBASSEMBLIES

Advanced Microwave Products
 Barry Industries Inc
 BellowsTech LLC
 CalibreRF Ltd
 Century Electronics
 Coaxial Components Corp (Coaxicom)
 ConductRF
 CTT Inc
 Dalau Inc

■ Mercury Systems

(See ad page 25)

Merrimac
 Mu-Del Electronics
 NI Microwave Components
 Pearson Machine Co LLC
 Pickering Interfaces Inc

■ R&D Interconnect Solutions

(See ad page 17)

Servometer
 Signal Technology
 Tamagawa Electronics Co Ltd
 Tango Wave
 Tektronix Component Solutions
 Teledyne Microelectronics
 Teledyne Storm Microwave
 TSC
 ViaSat Inc
 WL Gore & Associates

MIXED-SIGNAL DEVICES

Agile Microwave Technology Inc
 ASIC Advantage Inc
 BEEcube Inc, a National Instruments Co
 Cobham Antenna Systems

■ Falcon Electronics

(See ad page 14)

GigOptix Inc
 GPS Source Inc
 Kensington Electronics Inc

■ Mercury Systems

(See ad page 25)

Merrimac
 Signal Technology
 Silicon Radar GmbH
 STMicroelectronics Inc
 Tektronix Component Solutions

MMICS

AdTech Ceramics
 CalibreRF Ltd
 GigOptix Inc
 KAMAKA Electronic Bauelemente Vertriebs GmbH
 SHENMAO America Inc
 Silicon Radar GmbH
 TriQuint Semiconductor
 ViaSat Inc

OSCILLATORS/SYNTHESIZERS

CalibreRF Ltd
 Cobham AvComm (formerly Aeroflex Test Solutions)
 Continental Resources

■ Falcon Electronics

(See ad page 14)

Giga-tronics Inc
 Merrimac
 Microsemi Corp
 Mu-Del Electronics
 NI Microwave Components
 Signal Technology
 Silicon Radar GmbH
 Spectracom
 TallannQuest
 Tamagawa Electronics Co Ltd
 Tektronix Component Solutions
 TriQuint Semiconductor
 Ultraview Corp
 US Dynamics Corp

RF ATTENUATORS

Anritsu
 Barry Industries Inc
 CalibreRF Ltd
 Coaxial Components Corp (Coaxicom)
 Cobham Antenna Systems
 Continental Resources
 GPS Source Inc
 KAMAKA Electronic Bauelemente Vertriebs GmbH
 Keysight Technology Inc
 Merrimac
 Mouser Electronics
 MPB srl
 Pickering Interfaces Inc
 Radiency Technologies
 Signal Technology
 Streamline Circuits Corp
 SV Microwave
 Tamagawa Electronics Co Ltd

RF PACKAGING

AdTech Ceramics
 Agile Microwave Technology Inc
 AI Technology Inc
 Aries Electronics Inc
 Barry Industries Inc
 Boyd Corp
 Finetech

■ Innovative Integration

(See ad page 23)

Mu-Del Electronics
 Pearson Machine Co LLC
 SHENMAO America Inc
 Tech Products Inc
 Tektronix Component Solutions
 Teledyne Microelectronics

RF SWITCHES

Agile Microwave Technology Inc
 Analog Devices Inc
 Astronics Test Systems
 CalibreRF Ltd

Comtech PST
 ConductRF
 Electro-Mech Components Inc
 GPS Source Inc

■ Interstate Connecting Components

(See ad inside back cover)

Keysight Technology Inc
 Liteway Inc

■ Mercury Systems

(See ad page 25)

Merrimac
 Microsemi Corp
 Mouser Electronics
 Mu-Del Electronics
 Peregrine Semiconductor Corp
 Pickering Interfaces Inc
 Powell Electronics

■ R&D Interconnect Solutions

(See ad page 17)

Signal Technology
 Silicon Radar GmbH
 Tamagawa Electronics Co Ltd
 Teradyne
 TriQuint Semiconductor
 TTI Inc
 US Dynamics Corp

SIGNAL GENERATORS

4DSP LLC
 Advanced Test Equipment Rentals
 Anritsu
 Astronics Test Systems
 Avera
 AWT-Global LLC
 CalibreRF Ltd
 Cobham AvComm (formerly Aeroflex Test Solutions)
 Continental Resources
 Giga-tronics Inc
 GPS Source Inc

■ Innovative Integration

(See ad page 23)

Keysight Technology Inc
 Mu-Del Electronics
 NI Microwave Components
 Nutaq
 Phase Matrix
 Pickering Interfaces Inc

■ R&D Interconnect Solutions

(See ad page 17)

Saelig Co Inc
 Spectracom
 Tamagawa Electronics Co Ltd
 Teradyne
 US Dynamics Corp
 ViaSat Inc

TRANSMIT/RECEIVE MODULES

Advanced Microwave Products
 Avera
 CTT Inc
 ■ Innovative Integration
 (See ad page 23)
 Lexycom Technologies Inc

■ Mercury Systems

(See ad page 25)

Merrimac
 Mu-Del Electronics
 NI Microwave Components

PENTEK

■ Pentek Inc

(See ad page 21)

Powell Electronics

■ R&D Interconnect Solutions

(See ad page 17)

Signal Technology
 Silicon Radar GmbH
 Tango Wave
 TeraXion Inc
 TSC
 US Dynamics Corp

UP/DOWN CONVERTERS

4DSP LLC
 Agile Microwave Technology Inc
 Avera
 Behlman Electronics Inc
 CalibreRF Ltd
 CTT Inc
 Giga-tronics Inc
 ■ Innovative Integration
 (See ad page 23)
 Ironwood Electronics
 ■ Mercury Systems
 (See ad page 25)

Merrimac
 Mu-Del Electronics
 NI Microwave Components
 Phase Matrix

■ PICO Electronics Inc

(See ad page 1, 7)

Red Rapids

Red Rapids

Sagax Communications
 Signal Technology
 Silicon Radar GmbH
 Southwest Antennas
 Tango Wave
 Tektronix Component Solutions

SAFETY EQUIPMENT AND COMPONENTS

ALARM SYSTEMS

■ Applied Avionics Inc

(See ad page 55)

EMCOR Government Services
 LRAD Corp
 MoviTHERM

ALTITUDE ALERTS

- **Applied Avionics Inc**
(See ad page 55)

ANTI-ICING EQUIPMENT

UTC Aerospace Systems

ANTI-STATIC EQUIPMENT

Eureka Dry Tech
Nightstick
Quell Corp
Tef Cap Industries

COLLISION AVOIDANCE SYSTEMS

- **Applied Avionics Inc**
(See ad page 55)

EMI/RFI

AGDisplays
Amphenol Aerospace
Clark Testing
ConductRF
EMCCons Dr Rasek GmbH & Co KG
Epec Engineered Technologies

- **Gaia Converter**
(See ad page 19)

Kensington Electronics Inc
Quell Corp
Servometer
Techsil Ltd

FIRE DETECTION

- **Applied Avionics Inc**
(See ad page 55)
- EMCOR Government Services
Luna Optoelectronics
MoviTHERM
OZ Optics Ltd

STALL WARNING

- **Applied Avionics Inc**
(See ad page 55)
- SpaceAge Control Inc

TERRAIN AWARENESS WARNING SYSTEMS (TAWS)

- **Applied Avionics Inc**
(See ad page 55)

WINDSHEAR WARNING SYSTEMS

- **Applied Avionics Inc**
(See ad page 55)

SERVICES

ASSEMBLY/SUBCONTRACT SERVICES

Acieta
■ **Acromag Inc**
(See ad page 49)
ADCO Circuits
Advanced Precision Engineering Inc
AGDisplays
Altron
American Opto Plus LED Corp
Analytic Systems

Atrenne Integrated Solutions
Avo Photonics
BellowsTech LLC
Berliner Glas KGaA Herbert
Kubatz GmbH & Co
Blue Wolf
Boyd Corp
Century Electronics
Chassis Plans
CHI Cos
CNC-KE Inc
Coaxial Components Corp (Coaxicom)

- **Cobham Semiconductor Solutions (formerly Aeroflex)**
(See ad page 13)

Cobham RAD Solutions
(formerly Aeroflex)
ConductRF
Contract Manufacturing
Consultants Inc
CTT Inc
Custom Manufacturing &
Engineering Inc
dB Control
Digicom Electronics
Digital Core Design
DILAS Diode Laser Inc
e2v
Electro-Mech Components Inc
EMCCons Dr Rasek GmbH & Co KG
Essex Industries
Fischer Connectors Inc
GDCA Inc
G-S PLASTIC OPTICS
HALT and HASS Labs
Handling Specialty Manufacturing Ltd
Hughes Circuits Inc
Impact Technical Services Ltd
InnovaQuartz LLC

- **Interstate Connecting Components**
(See ad inside back cover)

Jewell Instruments
L-com Global Connectivity
Lenthor Engineering Inc
March Electronics Inc
Master Bond
Micom Laboratories Inc
Molex - Optical Solutions Group
Murrietta Circuits
Naprotek Inc
Nelson Design Services Inc
Nova Electric
PartMiner Industries
Pearson Machine Co LLC
PIC Wire & Cable
Powell Electronics
Projects Unlimited
QSDM Inc

- **R&D Interconnect Solutions**
(See ad page 17)

Reynard Corp
Saline Lectronics
SHENMAO America Inc
Specialty Coating Systems
S-Products Inc

SwissOptic AG
TASC Technical & Assembly
Services Corp
Tektronix Component Solutions
Teledyne Microelectronics
Teradyne
Video Scope International Ltd
Visotek Inc

CALIBRATION SERVICES

Custom Manufacturing &
Engineering Inc
EMCCons Dr Rasek GmbH & Co KG
Keysight Technology Inc
Lenox Laser
Lockheed Martin Santa
Barbara Focal Plane
Micom Laboratories Inc
MPB srl
OptoTest Corp
Qualmark Corp
Radiant Vision Systems
Teradyne
Video Scope International Ltd
Willrich Precision Instrument Co

CONSULTANTS

Advanced Thermal Solutions Inc
Alphi Technology
Altron
American Industrial Repair
Archer OpTx
Blue Wolf
Carr Quality Assurance Consulting
CHI Cos
Conscious Systems Engineering LLC
Contract Manufacturing
Consultants Inc
Design Criteria Inc
Digicom Electronics
Digital Core Design
DLS Electronic Systems Inc
■ **ECRIN Systems**
(See ad page 12)

Embassy Global
EMCCons Dr Rasek GmbH & Co KG
EMCOR Government Services
EnergyWatch
EO Strategies
Godlan Inc
Green Hills Software Inc
HALT and HASS Labs
Handling Specialty Manufacturing Ltd
Impact Technical Services Ltd
Industrial Training Consultants Inc
INICORE Inc
InnovaQuartz LLC

- **Innovative Integration**
(See ad page 23)

Keo Scientific Ltd
The Light Brigade Inc
Mentor Graphics Corp
Micom Laboratories Inc
Naprotek Inc
Nelson Design Services Inc
North Star Imaging

PALMARII Dynamics AB
Passat Ltd
Pearson Machine Co LLC
Pelorus Naval Systems Inc
Quality Consultants International Inc
Radio IP Software Inc
R Blaine Industries Inc
Resolved Analytics
SHENMAO America Inc
SME
Specialised Imaging Inc
Specialised Imaging Ltd
TallannQuest
TEN TECH LLC
Teradyne
TÜV SÜD America Inc
TXO Systems Ltd
Video Scope International Ltd
Visotek Inc

DESIGN ENGINEERING

4DSP LLC
Active Silicon Inc
ADCO Circuits
ADL Embedded Solutions Inc
Advanced Conversion Technology Inc
Advantech Corp
Aegis Power Systems Inc
Aero Dynamix Inc
AGDisplays
Allied Industrial Marketing
Allied Motion Technologies Inc
Altron
American Opto Plus LED Corp
Analytic Systems
Archer OpTx
Avo Photonics
Barco Federal Systems LLC
BellowsTech LLC



Boyd Corp
CERTON
Chassis Plans
CHI Cos
Clark Testing
Coaxial Components Corp (Coaxicom)
Conscious Systems Engineering LLC
Custom Manufacturing &
Engineering Inc
Dawn VME Products
Dedicated Computing
Design Criteria Inc
Digicom Electronics
DLS Electronic Systems Inc
Duraflex Inc
e2v
■ **ECRIN Systems**
(See ad page 12)
eInfochips
EMCOR Government Services

Epec Engineered Technologies

■ **Extreme Engineering Solutions Inc (X-ES)**

(See ad page 3, 43)

First Sensor Inc

Forza Silicon

GPS Source Inc

Handling Specialty Manufacturing Ltd

II-VI Inc

Impact Technical Services Ltd

Impulse Accelerated Technologies

Infinite Optics Inc

Infolytica Corp

INICORE Inc

InnovaQuartz LLC

■ **Innovative Integration**

(See ad page 23)

Integrated Dispensing Solutions Inc

Interconnect Systems Inc

Intersil

Jewell Instruments

Lensel Optics Pvt Ltd

Lexycom Technologies Inc

MAZeT GmbH

MegaWatt Lasers Inc

Molex - Optical Solutions Group

MPB srl

Nallatech

Northwire Inc

OptoTest Corp

Orion Technologies LLC

PALMARII Dynamics AB

PartMiner Industries

Pearson Machine Co LLC

Pelorus Naval Systems Inc

■ **Positronic**

(See ad page 53)

Raytheon Vision Systems

R Blaine Industries Inc

Resolved Analytics

Reynard Corp

SHENMAO America Inc

Southwest Antennas

Southwest Microwave

Sting Ray Optics LLC

TallannQuest

Teradyne

■ **Themis Computer**

(See ad page 47)

TSC

Vadatech Inc

Video Scope International Ltd

Vision Components GmbH

■ **VPT Inc**

(See ad page 8)

WOLF Advanced Technology

DISTRIBUTORS

A&A Coatings

■ **Acromag Inc**

(See ad page 49)

Allied International

American Opto Plus LED Corp

Arrow Electronics Inc

Cable Labels USA

CHI Cos

CNC Center

Control Techniques Unidrive

DAC International Inc

Eagle PLC

Foremay

Graham Magnetics

Impact Technical Services Ltd

■ **Interstate Connecting Components**

(See ad inside back cover)

JTime Inc

Kensington Electronics Inc

LPKF Laser & Electronics

Marshall Wolf Automation

Modicon PLC

MRO Drives

MRO Electric

MRO Stock

Nelco Products

Noramco Wire & Cable

PartMiner Industries

Phase 1 Technology Corp

Saelig Co Inc

SHENMAO America Inc

TTI Inc

SOFTWARE

APPLICATIONS

4DSP LLC

AdaCore

AIM-USA

Annapolis Micro Systems Inc

Avionics Interface Technologies (AIT)

Carr Quality Assurance Consulting

Computer Conversions Corp

Digital Core Design

dSPACE Inc

DSP Development Corp

Dspnor AS

eInfochips

esd electronics Inc

Godlan Inc

Impulse Accelerated Technologies

■ **Innovative Integration**

(See ad page 23)

Ironwood Electronics

K-Sun Corp

Lynx Software Technologies Inc

Mega-Fabs Motion Systems Ltd

Photron USA Inc

PrismTech

Radio IP Software Inc

Rapid Imaging Software Inc

Real-Time Innovations

TRAXPayroll

Vision Components GmbH

COMMUNICATIONS/ NETWORKING

Barco Federal Systems LLC

Cable Labels USA

Clear-Com

Computer Conversions Corp

Cornet Technology Inc

Digital Core Design

esd electronics Inc

Graphic Products

Green Hills Software Inc

H&L Instruments LLC

Honeywell Aerospace

Impulse Accelerated Technologies

■ **Interface Concept**

(See ad page 18)

Lynx Software Technologies Inc

Nutaq

Pleora Technologies Inc

PrismTech

Radio IP Software Inc

Real-Time Innovations

Rockwell Automation Inc

SYSGO

Vector Informatik GmbH

DATABASE MANAGEMENT

Averna

Great River Technology

Rockwell Automation Inc

UTC Aerospace Systems

DATABASES

Godlan Inc

Rockwell Automation Inc

TRAXPayroll

DATA SECURITY

Digital Core Design

Global Training Solutions Inc

Green Hills Software Inc

Impulse Accelerated Technologies

Lynx Software Technologies Inc

PrismTech

Radio IP Software Inc

Shoghi Communications

■ **Themis Computer**

(See ad page 47)

DESIGN AND DEVELOPMENT TOOLS

■ **Abaco Systems**

(See ad back cover)

AdaCore

Aldec Inc

Astronics Ballard Technology

Avionics Interface Technologies (AIT)

BittWare

CERTON

■ **Data Device Corp (DDC)**

(See ad page 15)

DDC-I Inc

Digital Core Design

dSPACE Inc

DSP Development Corp

Godlan Inc

Graphic Products

Green Hills Software Inc

Hitex GmbH

Impulse Accelerated Technologies

Infolytica Corp

■ **Innovative Integration**

(See ad page 23)

Jama Software

Keysight Technology Inc

Lambda Research Corp

LAS-CAD GmbH

Lynx Software Technologies Inc

Marvin Test Solutions Inc

MathWorks Inc

MAZeT GmbH

Mega-Fabs Motion Systems Ltd

Mentor Graphics

Mentor Graphics Corp

PrismTech

PTC

Radiant Vision Systems

Real-Time Innovations

Rockwell Automation Inc

Vector Informatik GmbH

Vision Components GmbH

DOCUMENT MANAGEMENT SYSTEMS

dSPACE Inc

Godlan Inc

Jama Software

Rockwell Automation Inc

ELECTRONIC DESIGN AUTOMATION (EDA)

Control Techniques Unidrive

Digital Core Design

Eagle PLC

eInfochips

Godlan Inc

Impulse Accelerated Technologies

MRO Drives

Rockwell Automation Inc

UTC Aerospace Systems

GRAPHICS AND SIMULATION

■ **Abaco Systems**

(See ad back cover)

Active Silicon Ltd

AIM-USA

Astronics Ballard Technology

dSPACE Inc

DSP Development Corp

eInfochips

Exa Corp

Global Training Solutions Inc

Impulse Accelerated Technologies

Industrial Training Consultants Inc

MathWorks Inc

Rapid Imaging Software Inc

Resolved Analytics

Siemens PLM Software

Vector Informatik GmbH

INFORMATION SECURITY

AdaCore

Digital Core Design

Global Training Solutions Inc

Green Hills Software Inc
Lynx Software Technologies Inc
PrismTech
Radio IP Software Inc
Shoghi Communications
SYSGO

MOVING MAPS

Radio IP Software Inc
Rapid Imaging Software Inc

OPERATING SYSTEMS

■ Abaco Systems

(See ad back cover)

Dedicated Computing
Digital Core Design

■ Elma Electronic Inc

(See ad page 29)

Global Training Solutions Inc
Green Hills Software Inc

■ Interface Concept

(See ad page 18)

Lynx Software Technologies Inc
Mentor Graphics Corp
Microway Inc
PTC
SYSGO

■ Themis Computer

(See ad page 47)

■ VersaLogic Corp

(See ad page 48)

PRODUCT LIFE CYCLE MANAGEMENT (PLM)

Averna
Avionics Interface Technologies (AIT)
CERTON
Dedicated Computing
e2v
Godlan Inc
Green Hills Software Inc
Jama Software
PTC
Rockwell Automation Inc
Siemens PLM Software
UTC Aerospace Systems

PROGRAMMING LANGUAGES

AdaCore
DDC-I Inc
Digital Core Design
eInfochips
Global Training Solutions Inc
Green Hills Software Inc
Impulse Accelerated Technologies
MathWorks Inc
Mega-Fabs Motion Systems Ltd
PTC

REAL-TIME OPERATING SYSTEMS (RTOS) AND KERNELS

■ Abaco Systems

(See ad back cover)

AdaCore
DDC-I Inc
eInfochips

esd electronics Inc
Green Hills Software Inc
Hitex GmbH

■ Interface Concept

(See ad page 18)

Lynx Software Technologies Inc
PrismTech
PTC
SYSGO

■ Themis Computer

(See ad page 47)

Vision Components GmbH

SOFTWARE CODE DESIGN, TEST, AND VERIFICATION

4DSP LLC
AdaCore
AIM-USA
Averna
Avionics Interface Technologies (AIT)
Blue Wolf
CERTON
dSPACE Inc
eInfochips
Green Hills Software Inc
Hitex GmbH
Impulse Accelerated Technologies
Lynx Software Technologies Inc
MathWorks Inc
Mentor Graphics Corp
MRO Electric
PrismTech
Verocel
Vision Components GmbH

TEST AND MEASUREMENT

CALIBRATION EQUIPMENT

Avalon International Corp
Averna
Carr Quality Assurance Consulting
Cincinnati Sub-Zero (CSZ)
Cleanroom Connection Inc
Cobham Antenna Systems
ConductRF
Custom Manufacturing & Engineering Inc
Electronic Development Labs Inc (EDL)
Keysight Technology Inc
Konica Minolta Sensing Americas Inc
Marvin Test Solutions Inc
Nutaq
Omega Engineering Inc
OptoTest Corp
Oxford Instruments
PCE Instruments UK Ltd
Radiant Vision Systems
Reynard Corp
Rockwell Automation Inc
Spectracom
Versatile Power
Willrich Precision Instrument Co

COTS UPSCREENING

Adimec Advanced Image Systems BV
Automated Motion
DLS Electronic Systems Inc
Silicon Designs Inc
TallannQuest
Tektronix Component Solutions
TÜV SÜD America Inc

EMC COMPLIANCE

Advanced Test Equipment Rentals
Clark Testing
DLS Electronic Systems Inc
EMCCons Dr Rasek GmbH & Co KG
Keysight Technology Inc
MPB srl
Saelig Co Inc
Saline Electronics
Teledyne LeCroy

HALT/HASS

Advanced Test Equipment Rentals
Aries Electronics inc
Averna
Cincinnati Sub-Zero (CSZ)
Clark Testing
CSZ Testing
dB Control
DLS Electronic Systems Inc
EMCCons Dr Rasek GmbH & Co KG
Epec Engineered Technologies
HALT and HASS Labs
inTEST Thermal Solutions
Microm Laboratories Inc
Projects Unlimited
Qualmark Corp
Saline Electronics
Screening Systems Inc
TÜV SÜD America Inc

METERS

Advanced Test Equipment Rentals
Advanced Thermal Solutions Inc
Carr Quality Assurance Consulting
Cleanroom Connection Inc
EXFO
Jewell Instruments
Keysight Technology Inc
Konica Minolta Sensing Americas Inc
Lenox Laser
Microm Laboratories Inc
MPB srl
Omega Engineering Inc
OptoTest Corp
Oxford Instruments
PartMiner Industries
PCE Instruments
PCE Instruments UK Ltd
Radiant Vision Systems
Rockwell Automation Inc
RWC Testing & Lab Supplies
Saelig Co Inc
SurplusEQ.com
Teradyne
Willrich Precision Instrument Co

NETWORK ANALYZERS

Advanced Test Equipment Rentals
Anritsu
Avionics Interface Technologies (AIT)
Cleanroom Connection Inc
ConductRF
Continental Resources
■ Data Device Corp (DDC)
(See ad page 15)
EXFO
Go4Fiber Ltd
Keysight Technology Inc
NextComputing
OptoTest Corp
Oxford Instruments
PCE Instruments
PCE Instruments UK Ltd
SurplusEQ.com
Teledyne LeCroy
TXO Systems Ltd
Vector Informatik GmbH

NETWORK/DATA BUS ANALYZERS

AIM-USA
Anritsu
Astronics Ballard Technology
Avionics Interface Technologies (AIT)
Cobham AvComm (formerly Aeroflex Test Solutions)
Data Bus Products
■ Data Device Corp (DDC)
(See ad page 15)
Marvin Test Solutions Inc
NextComputing
PartMiner Industries
Saelig Co Inc
Teradyne
Vector Informatik GmbH

OPTICAL TEST AND MEASUREMENT

Adimec Advanced Image Systems BV
Advanced Thermal Solutions Inc
American Opto Plus LED Corp
Anritsu
Aries Electronics inc
Averna
Coherent Solutions
Continental Resources
Corning Optical Communications
DiCon Fiberoptics Inc
EXFO
Fiberscope.net
Fibersense & Signals Inc
GEViCAM Inc
Go4Fiber Ltd
G-S PLASTIC OPTICS
H&L Instruments LLC
Hirox-USA Inc
Infinite Optics Inc
ISVI Corp
Keo Scientific Ltd
KEYENCE Corp of America
Keysight Technology Inc

Konica Minolta Sensing Americas Inc
Kowa American Corp
Krell Technologies Inc
Lambda Research Corp
Laser Physics UK Ltd
Lenox Laser
The Light Brigade Inc
Luciol Instruments SA
Lumetrics Inc
Marvin Test Solutions Inc
MAZeT GmbH
Micom Laboratories Inc
Micro Laser Systems Inc
MoviTHERM
MPB srl
Newport Corp
North Star Imaging
Novacam Technologies Inc
OptoTest Corp
Oxford Instruments
OZ Optics Ltd
PCE Instruments
PCE Instruments UK Ltd
Photon Control Inc
Photon USA Inc
Radiant Vision Systems
Reynard Corp
RWC Testing & Lab Supplies
Sensors Unlimited Products
Sierra-Olympic Technologies Inc (SOTI)
Specialised Imaging Inc
Specialised Imaging Ltd
Sting Ray Optics LLC
SurplusEQ.com
SwissOptic AG
Teledyne LeCroy
Toshiba Imaging Systems Div
Versatile Power
Vision Components GmbH
Willrich Precision Instrument Co

OSCILLOSCOPES

Advanced Test Equipment Rentals
Anritsu
Cobham AvComm (formerly Aeroflex Test Solutions)
Continental Resources
Electronic Development Labs Inc (EDL)
Keysight Technology Inc
Omega Engineering Inc
PCE Instruments
PCE Instruments UK Ltd
Saelig Co Inc
SurplusEQ.com
Teledyne LeCroy

PORTABLE TEST SYSTEMS

Advanced Thermal Solutions Inc
AIM-USA
Anritsu
Astronics Ballard Technology
Astronics Test Systems
Automated Motion
Avalon International Corp

Averna
Avionics Interface Technologies (AIT)
AWT-Global LLC
Bustec Inc
Cincinnati Sub-Zero (CSZ)
Cleanroom Connection Inc
Cobham AvComm (formerly Aeroflex Test Solutions)
Continental Resources
Custom Manufacturing & Engineering Inc

■ Data Device Corp (DDC) (See ad page 15)

Electronic Development Labs Inc (EDL)
esd electronics Inc
EXFO
Fiberscope.net
Fibersense & Signals Inc
Fuel Quality Services Inc
GEVICAM Inc
Go4Fiber Ltd
Henniker Plasma

■ Innovative Integration (See ad page 23)

IO Industries Inc
Keysight Technology Inc
Konica Minolta Sensing Americas Inc
Marvin Test Solutions Inc
MoviTHERM
MPB srl
NextComputing
Nutaq
Omega Engineering Inc
OptoTest Corp
Oxford Instruments
PCE Instruments
PCE Instruments UK Ltd

PENTEK

■ Pentek Inc (See ad page 21)

Phase Matrix
Qualmark Corp
Radiant Vision Systems
Rockwell Automation Inc
RWC Testing & Lab Supplies
Saelig Co Inc
Siemens Process Industries and Drives
Silicon Designs Inc
Spectracom
Teradyne
United Electronic Industries Inc
Vector Informatik GmbH
Versatile Power

SOFTWARE-DRIVEN INSTRUMENTATION

4DSP LLC
■ Abaco Systems
(See ad back cover)

AIM-USA
Astronics Test Systems
Averna
Avionics Interface Technologies (AIT)
AWT-Global LLC
Cobham AvComm (formerly Aeroflex Test Solutions)
Coherent Inc
■ Innovative Integration
(See ad page 23)
Keysight Technology Inc
Konica Minolta Sensing Americas Inc
Marvin Test Solutions Inc
MathWorks Inc
MPB srl
Nutaq
OptoTest Corp
Oxford Instruments
PCE Instruments UK Ltd
Photon Control Inc
Radiant Vision Systems



Red Rapids

Rockwell Automation Inc
Sagax Communications
Teradyne
TÜV SÜD America Inc
Ultraview Corp
Versatile Power
Vision Components GmbH

SPECTRUM ANALYZERS

4DSP LLC
Advanced Test Equipment Rentals
Anritsu
Astronics Test Systems
Averna
Cobham AvComm (formerly Aeroflex Test Solutions)
Coherent Inc
Continental Resources
EXFO

■ Innovative Integration (See ad page 23)

Keysight Technology Inc
MAZeT GmbH
MPB srl
Newport Corp
Nutaq
Oxford Instruments
PCE Instruments
PCE Instruments UK Ltd
Photon Control Inc
Princeton Infrared Technologies Inc (PIRT)
Saelig Co Inc
Sagax Communications
Spectracom

THERMAL MANAGEMENT/ COOLING SYSTEMS

CONDUCTION COOLING

■ Acromag Inc (See ad page 49)

ADL Embedded Solutions Inc
AI Technology Inc
Annapolis Micro Systems Inc
Atrenne Integrated Solutions
Barry Industries Inc
BV Thermal Systems
Dawn VME Products
Electronic Development Labs Inc (EDL)

■ Elma Electronic Inc (See ad page 29)

EMCOR Government Services

■ Extreme Engineering Solutions Inc (X-ES) (See ad page 3, 43)

■ Interface Concept (See ad page 18)

Orion Technologies LLC
Pearson Machine Co LLC
Sealing Devices Inc

■ Systel Rugged Computers (See ad page 27)

TEN TECH LLC

■ Themis Computer (See ad page 47)

CONVECTION COOLING

ADL Embedded Solutions Inc
Allied International
Annapolis Micro Systems Inc
Atrenne Integrated Solutions
BV Thermal Systems
Dawn VME Products
Dynamic Engineering
EMCOR Government Services

■ Extreme Engineering Solutions Inc (X-ES) (See ad page 3, 43)

■ Interface Concept (See ad page 18)

inTEST Thermal Solutions
Pearson Machine Co LLC

■ Systel Rugged Computers (See ad page 27)

TEN TECH LLC

■ Themis Computer (See ad page 47)

LIQUID COOLING

Atrenne Integrated Solutions
BV Thermal Systems
CPC (Colder Products Co)
Dedicated Computing
inTEST Thermal Solutions
Meggit Defense Systems
Omega Engineering Inc

■ Systel Rugged Computers (See ad page 27)

TEN TECH LLC

4DSP LLC

3101 Bee Caves Rd, Suite 350, Austin, TX 78746, 800-816-1751, sales@4dsp.com, www.4dsp.com

A&A Coatings

2700 S Clinton Ave, South Plainfield, NJ 07080, 888-725-0150, info@thermalspray.com, www.thermalspray.com



Abaco Systems

12090 Memorial Pkwy SW, Huntsville, AL 35803, 866-652-2226, www.abaco.com

With more than 30 years of experience, is the leader in open architecture rugged embedded systems. According to IHS, is also the world leader in VITA technology boards. Delivers market-leading commercial off-the-shelf and custom products and program life cycle management to reduce time to deployment, cost and risk.

(See ad back cover)

ACCES I/O Products

10623 Roselle St, San Diego, CA 92121, 858-550-9559, sales@accesio.com, www.accesio.com

Acieta

912 Pioneer Blvd, Santa Fe Springs, CA 90670, 562-576-1103, info@acieta.com, www.acieta.com

Acqu Technology Inc

2841 Saturn St, Suite J, Brea, CA 92821, 714-993-4964, sales@acqu.com, www.acqushop.com

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30765 S Wixom Rd, Wixom, MI 48393-2417, 877-295-7087, sales@acromag.com, www.acromag.com

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(See ad page 49)

Active Silicon Inc

479 Jumpers Hole Rd, Suite 301, Severna Park, MD 21146, 410-696-7642, info@activesilicon.com, www.activesilicon.com

Active Silicon Ltd

Pinewood Mews, Bond Close, Iwer SLO ONA, UK, 44-1753-650-600, info@activesilicon.com, www.activesilicon.com

AdaCore

150 W 30th St, 16th Fl, New York, NY 10001, 212-620-7300, sales@adacore.com, www.adacore.com

ADCO Circuits

2868 Bond St, Rochester Hills, MI 48309, 248-853-6620, sales@adcocircuits.com, www.adcocircuits.com

Adimec Advanced Image Systems BV

Luchthavenweg 91, Eindhoven 5657 EA, Netherlands, 31-40-2353900, marketing@adimec.com, www.adimec.com

ADL Embedded Solutions Inc

4411 Morena Blvd, Suite 101, San Diego, CA 92117-4345, 858-490-0597, sales@adl-usa.com, www.adl-usa.com

AdTech Ceramics

511 Manufacturers Rd, Chattanooga, TN 37405, 423-755-5400, sales@adtechceramics.com, www.adtechceramics.com

Advanced Coating Service

15 Hytec Cir, Rochester, NY 14606, 585-247-3970, www.acscoating.com



Advanced Conversion Technology Inc

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Designs and manufactures reliable, affordable, high-performance AC-DC and DC-DC power supplies (ruggedized switching, rack-mounted, VME, linear, and more), custom or COTS, for various applications since 1981. Designs meet the typical MIL standards including MIL-STD-704, MIL-STD-1399, MIL-STD-1275, MIL-STD-461, and MIL-STD-810. QMS is AS9100C. Made in the USA.

Advanced Interconnections Corp

5 Energy Way, West Warwick, RI 02893, 401-823-5200, info@advanced.com, www.advanced.com

Advanced Micro Devices Inc

1 AMD Pl, Sunnyvale, CA 94088, 408-749-4000, info@amd.com, www.amd.com

Advanced Microwave Products

8748 Technology Way, Reno, NV 89521, 775-345-9933, sales@advmw.com, www.advmw.com

Advanced Night Visions Systems Inc (ANVS)

801 W Robinson Dr, Suite 500, North Salt Lake, UT 84054, 801-519-0500, support@anvsinc.com, www.anvsinc.com

Advanced Photonix Inc

Picometrix Div, 2925 Boardwalk, Ann Arbor, MI 48104, 734-864-5600, sales@advancedphotonix.com, www.advancedphotonix.com

Advanced Precision Engineering Inc

16 Mitchell Rd, Ipswich, MA 03045-0549, 978-356-7303, tnelson@ape10.com, www.ape10.com

Advanced Test Equipment Rentals

10401 Roselle St, San Diego, CA 92121, 800-404-2832, rentals@atecorp.com, www.atecorp.com

Advanced Thermal Solutions Inc

89-27 Access Rd, Norwood, MA 02062, 781-769-2800, sales@qats.com, www.qats.com

Advantech Corp

13 Whatney, Irvine, CA 92618, 949-420-2500, buy@advantech.com, www.advantech.com

Aegis Power Systems Inc

805 Greenlawn Cemetery Rd, Murphy, NC 28906, 828-837-4029, mae@aegispower.com, www.aegispower.com

Aero Dynamix Inc

3227 W Euless Blvd, Euless, TX 76040, 817-571-0729, sparker@aerodynamix.com, www.aerodynamix.com

Aerospace Maintenance Solutions LLC

8759 Mayfield Rd, Chesterland, OH 44026, 440-729-7703, bruce@aerospacellc.com, www.aerospacellc.com

Aerotech Inc

101 Zeta Dr, Pittsburgh, PA 15238, 412-963-7470, sales@aerotech.com, www.aerotech.com

AGDisplays

(sub of AssetGenie Inc), 220 Huff Ave, Suite 400, Greensburg, PA 15601, 724-552-4904, sales@agdisplays.com, www.agdisplays.com

Agile Microwave Technology Inc

101 Bloomingdale Rd, Hicksville, NY 11801, 516-931-1760, info@agilemwt.com, www.agilemwt.com

AIM-USA

7 Neshaminy Interplex, Suite 211, Trevese, PA 19053, 267-982-2600, salesusa@aim-online.com, www.aim-online.com

AirBorn Inc

3500 Airborn Cir, Georgetown, TX 78626, 512-863-5585, abinfo@airborn.com, www.airborn.com

Aitech Defense Systems Inc

19756 Prairie St, Chatsworth, CA 91311, 888-248-3248, sales@rugged.com, www.rugged.com

Aitech Systems Ltd

4 Maskit St, PO Box 4128, Herzlia 46140, Israel, 972-9-960-0683, jhalevy@rugged.com, www.rugged.com

AI Technology Inc

70 Washington Rd, Princeton Junction, NJ 08550, 609-799-9388, ait@aittechnology.com, www.aittechnology.com

Alaska Structures

9024 Vanguard Dr, Suite 101, Anchorage, AK 99507, 907-344-1565, inquiry@alaskastructures.com, www.alaskastructures.com

Aldec Inc

2260 Corporate Cir, Henderson, NV 89074, 702-990-4400, sales@aldec.com, www.aldec.com

Allied Industrial Marketing

W67 N222 Evergreen Blvd, Suite 209, Cedarburg, WI 53012, 262-618-2403, info@alliedindustrialmarketing.com, www.alliedindustrialmarketing.com

Allied International

7 Hill St, Bedford Hills, NY 10507, 914-241-6900, alec@alliedinter.com, www.alliedinter.com

Allied Motion Technologies Inc

495 Commerce Dr, Suite 3, Amherst, NY 14228, 716-242-7535, inquiry@alliedmotion.com, www.alliedmotion.com

Alpha Assembly Solutions

(div of MacDermid Performance Solutions), 300 Atrium Dr, Somerset, NJ 08873, 908-791-3045, lkeller@alphaassembly.com, www.alphaassembly.com

Alphi Technology

1898 E Southern Ave, Tempe, AZ 85282-5836, 480-838-2428, sales@alphitech.com, www.alphitech.com

Altera Corp

101 Innovation Dr, San Jose, CA 95134, 408-544-7000, newsroom@altera.com, www.altera.com

Altron

6700 Bunker Lake Blvd NW, Minneapolis, MN 55303, 763-427-7735, sales@altronmfg.com, www.altronmfg.com

Alturdyne Power Systems

660 Steele St, El Cajon, CA 92020, 619-440-5531, info@alturdyne.com, www.alturdyne.com

American Industrial Repair

500 Westover Dr, Suite 10447, Sanford, NC 27330, sales@americanindustrialrepair.com, www.americanindustrialrepair.com

American Opto Plus LED Corp

1206 E Lexington Ave, Pomona, CA 91766, 909-465-0080, info@aopled.com, www.aopled.com

American Portwell Technology

44200 Christy St, Fremont, CA 94538, 510-403-3399, info@portwell.com, www.portwell.com

Amphenol Aerospace

(div of Amphenol Corp), 40-60 Delaware Ave, Sidney, NY 13838, 800-678-0141, cservice@amphenol-aao.com, www.amphenol-aerospace.com

Amphenol Industrial Products Group

40-60 Delaware Ave, Sidney, NY 13838-1395, 800-678-0141, mhartman@amphenol-aio.com, www.amphenol-industrial.com

Amphenol PCD

(div of Amphenol Corp), 72 Cherry Hill Dr, Beverly, MA 01915, 978-624-3400, info@amphenolpcd.com, www.amphenolpcd.com

AMWEI Thermistor Sensor

11-502 Songpingshan, Langshan Rd, North Area, Shenzhen High Tech Industrial Pk, Nanshan, Shenzhen, Guangdong 518057, China, 86-755-2657-0111, sales@amwei.com, www.amwei.com

Analog Devices Inc

3 Technology Way, Norwood, MA 02062, 781-329-4700, www.analog.com

Analytic Systems

8128 River Way, Delta, BC V4G 1K5, Canada, 604-946-9981, info@analyticssystem.com, www.analyticssystem.com

Annapolis Micro Systems Inc

190 Admiral Cochrane Dr, Suite 130, Annapolis, MD 21401, 410-841-2514, wfinfo@annapmicro.com, www.annapmicro.com

Anritsu

1155 E Collins Blvd, Suite 100, Richardson, TX 75081, 800-267-4878, www.anritsu.com



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Archer OpTx

1208 Sigma Ct, Rockwall, TX 75087, 972-722-1064, sales@archeroptx.com, www.archeroptx.com

Aries Electronics inc

2609 Bartram Rd, Bristol, PA 19007, 215-781-9956, info@arieselec.com, www.arieselec.com

Arkema Inc

900 First Ave, King of Prussia, PA 19406, 610-205-7000, arkema.usph-general@arkema-inc.com, www.arkema-americas.com

Arnold Magnetics Corp

841 Avenida Acaso, Camarillo, CA 93012, 805-484-4221, customerservice@amcpower.com, www.amcpower.com

Arrow Electronics Inc

7459 S Lima St, Bldg 1, Englewood, CO 80112, 800-833-3557, www.arrow.com

ASIC Advantage Inc

1290-B Reamwood Ave, Sunnyvale, CA 94089, 408-541-8686, sales@asicadvantage.com, www.asicadvantage.com

Astronics Ballard Technology

11400 Airport Rd, Suite 201, Everett, WA 98204, 425-339-0281, sales@ballardtech.com, www.ballardtech.com

Astronics Test Systems

4 Goodyear, Irvine, CA 92618, 949-859-8999, atsinfo@astronics.com, www.astronics.com

Atrenne Integrated Solutions

10 Mupac Dr, Brockton, MA 02301, 508-588-6110, sales@atrenne-cs.com, www.atrenne.com

Automated Motion

Oxygen Products Div, 807 NW Commerce Dr, Lees Summit, MO 64086, 816-525-8304, rtaylor@automatedmotion.com, www.automatedmotion.com

Avalon International Corp

317 Lockwood Ave, Northfield, IL 60093, 847-446-9986, info@bugcheck.us, www.avalongateway.com

Aveox Inc

2265 Ward Ave, Suite A, Simi Valley, CA 93065, 805-915-0200, tsievers@aveox.com, www.aveox.com

Averna

87 Prince St, 5th Fl, Montreal, QC H3C 2M7, Canada, 514-842-7577, sales@averna.com, www.averna.com

Avionics Interface Technologies (AIT)

14769 California St, Omaha, NE 68154, 402-763-9644, sales@aviftech.com, www.aviftech.com

AvionTEq

7240 Hayvenhurst Pl, Van Nuys Airport, Van Nuys, CA 91406, sales@avionteq.com, www.avionteq.com

Avo Photonics

700 Business Ctr Dr, Suite 125, Horsham, PA 19044, 215-441-0107, sales@avophotonics.com, www.avophotonics.com

AWT-Global LLC

117 Grand Ave, Hackettstown, NJ 07840, 973-321-3423, info@awt-global.com, www.awt-global.com

Ball Aerospace and Technologies Corp

(sub of Ball Corp), 1600 Commerce St, Boulder, CO 80303, 303-939-4000, media@ball.com, www.ballaerospace.com

Barco Federal Systems LLC

3059 Premiere Pkwy, Suite 100, Duluth, GA 30097, 678-475-8080, www.barco.com

Barry Industries Inc

60 Walton St, Attleboro, MA 02703, 508-226-3350, sales@barryind.com, www.barryind.com

BearCom

4009 Distribution Dr, Garland, TX 75041, 800-527-1670, info@bearcom.com, www.bearcom.com

BEEcube Inc, a National Instruments Co

4600 Patrick Henry Dr, Santa Clara, CA 95054, 510-248-4643, sales@beecube.com, www.beecube.com

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1 N Brentwood Blvd, 15th Fl, St Louis, MO 63105, 800-235-3361, info@belden.com, www.belden.com

BellowTech LLC

(sub of Servometer), 1289 N US Hwy 1, Suite 1, Ormond Beach, FL 32174, 386-615-7530, bellowtech@bellowtech.com, www.bellowtech.com

BE Meyers & Co Inc

9461 Willows Rd NE, Redmond, WA 98052, 425-881-6648, sales@bemeyers.com, www.bemeyers.com

Berliner Glas KGaA Herbert Kubatz GmbH & Co

Space Div, (sub of Berliner Glas Group), Waldkraiburger Str 5, Berlin 12347, Germany, 49-30-60905-0, info@berlinerklas.de, www.berlinerklas.com

BittWare

45 S Main St, Concord, NH 03301, 603-226-0404, info@bittware.com, www.bittware.com



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95135, 408-297-8700,
sales@bravobravo.com,
www.bravobravo.us

Bustec Inc

6137W 10930N, Highland, UT 84003,
385-207-8232,
per.lindberg@bustec.com,
www.bustec.com

BV Thermal Systems

(div of Budzar Industries),
38241 Willoughby Pkwy, Willoughby,
OH 44094, 209-522-3701,
sales@bvthermal.com,
www.bvthermal.com

Cable Labels USA

Network Connections Group USA Div,
Lake Mary Blvd, Lake Mary, FL 32746,
407-321-7394,
info@cablelabelsusa.com,
www.cablelabelsusa.com

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132 W Las Cruces Ave, Las Cruces, NM
88001, 505-525-0131,
sales@calculcx.com, www.calculcx.com

CalibreRF Ltd

8 Watkin Walk, Biggleswade, Beds
SG18 0BA, UK, 44-7545-220-026,
enquiries@calibrerf.co.uk,
www.calibrerf.co.uk

Carr Quality Assurance Consulting

28536 Oakmont, Mission Viejo, CA
92692, 949-306-4354,
fred@carrconsulting.org,
www.carrconsulting.org

CAS DataLoggers Inc

8437 Mayfield Rd, Unit 104,
Chesterland, OH 44026, 440-729-2570,
sales@dataloggerinc.com,
www.dataloggerinc.com

Cell-Con Inc

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19341, 800-771-7139,
sales@cell-con.com, www.cell-con.com

Central Semiconductor Corp

145 Adams Ave, Hauppauge,
NY 11788, 631-435-1110,
tdonofrio@centralsemi.com,
www.centralsemi.com

Century Electronics

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Ct, Newbury Park, CA 91320,
805-498-9838, info@centuryele.com,
www.centuryele.com

CERTON

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32924, 321-674-2155,
sales@certon.com, www.certon.com

Chassis Plans

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San Diego, CA 92127, 858-571-4330,
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www.chassis-plans.com

CHI Cos

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55317, 952-448-6225,
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Ciena Corp

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410-865-8500, www.ciena.com

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indsales@genthermcsz.com,
www.cszindustrial.com

Cirexx International Inc

791 Nuttman St, Santa Clara, CA 95054,
408-988-3980, dkaufman@cirexx.com,
www.cirexx.com

Clark Testing

1801 Rt 51, Jefferson Hills, PA 15025,
412-387-1001, info@clarktesting.com,
www.clarktesting.com

Clary Corp

150 E Huntington Dr, Monrovia, CA
91016, 626-359-4486,
sales@clary.com, www.clary.com

Cleanroom Connection Inc

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516-596-8781,
sales@cleanroomconnection.com,
www.cleanroomconnection.com

Clear-Com

1301 Marina Village Pkwy, Suite 105,
Alameda, CA 94501, 855-237-4624,
magsales@clearcom.com,
www.clearcom.com

ClearDrain

(div of Melville Industries Inc),
PO Box 555, Willingboro, NJ 08046,
856-461-0091,
sales@cleardrainusa.com,
www.cleardrainusa.com

CNC Center

1652 Old Apex Rd, Cary, NC 27513,
919-650-2703, sales@cnccenter.com,
www.cnccenter.com

CNC-KE Inc

(sub of Kentucky Electronics),
3401 N Graham St, Charlotte, NC
28206, 704-333-0145,
charjennings@cnc-ke.com,
www.cncke.com

Coaxial Components Corp (Coaxicom)

1501 SE Decker Ave, #201, Stuart, FL
34994-3964, 866-262-9426,
sales@coaxicom.com,
www.coaxicom.com

■ Cobham Semiconductor Solutions (formerly Aeroflex)

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Cobham AvComm (formerly Aeroflex Test Solutions)

10200 W York St, Wichita, KS 67215,
316-522-4981, info-test@aeroflex.com,
http://ats.aeroflex.com

Cobham Mission Systems

2734 Hickory Grove Rd, Davenport, IA
52804, 563-383-6000,
cms.iainfo@cobham.com,
www.cobham.com

Cobham RAD Solutions (formerly Aeroflex)

5030 Centennial Blvd, Colorado Springs,
CO 80919, 719-531-0800,
info-ams@aeroflex.com,
www.aeroflex.com/rad

Coherent Inc

5100 Patrick Henry Dr, Santa Clara, CA
95054, 408-764-4983,
tech.sales@coherent.com,
www.coherent.com

Coherent Solutions

Unit A, 28 Canaveral Dr, Rosedale,
Auckland 0632, New Zealand,
64-9-478-4849,
sales@coherent-solutions.com,
www.coherent-solutions.com

Components Technology Institute Inc

2608 Artie St, Suite 4, Huntsville, AL
35805, 256-536-1304,
leon.hamiter34@cti-us.com,
www.cti-us.com

Computer Conversions Corp

6 Dunton Ct E, East Northport, NY
11731, 631-261-3300,
sales@computerconversions.com,
www.computerconversions.com

Comtech PST

(sub of Comtech Telecommunications
Corp), 105 Baylis Rd, Melville, NY 11747,
631-777-8900,
bob.califra@comtechpst.com,
www.comtechpst.com

Comtech TCS SSD

(div of Command and Control
Technologies), 206 Kelsey Ln,
Tampa, FL 33619, 813-418-8070,
www.telecomsys.com

ConductRF

(sub of Electronic Assemblies Mfg Inc),
126 Merrimack St, Methuen, MA 01844,
978-374-6840, sales@conductrf.com,
www.conductrf.com

Conscious Systems Engineering LLC

314 Forrest Valley Dr, Nashville, TN
37209, 314-495-2293,
info@consyseng.com,
www.consyseng.com

Continental Resources

Test Equipment Div, 175 Middlesex Tpke,
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01730-9137, 800-937-4688,
testequipmentteam@conres.com,
www.conres.com/test-equipment

Contract Manufacturing Consultants Inc

8201 164th Ave NE, Suite 200,
Redmond, WA 98052, 425-629-6288,
admin@cmcseattle.com,
www.cmcseattle.com

Control Techniques Unidrive

1652 Old Apex Rd, Cary, NC 27513,
800-691-8511,
sales@controltechniquesunidrive.com,
www.controltechniquesunidrive.com

■ Cornell Dubilier Electronics

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29657, 864-843-2277,
cdelb@cde.com, www.cde.com

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electrolytic, AC and DC film, and mica
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Its customers are world leaders in
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UPS systems, motor drives, military
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(See ad page 9)

Cornet Technology Inc

6800 Versar Ctr, Springfield, VA 22151,
703-658-3400, sales@cornet.com,
www.cornet.com

Corning Optical Communications

(div of Corning Inc), 800 17th St NW, Hickory, NC 28601, 828-901-5000, www.corning.com/opcomm

Cortec Corp

4119 White Bear Pkwy, St Paul, MN 55110, 651-429-1100, info@cortecvci.com, www.cortecvci.com

CPC (Colder Products Co)

1001 Westgate Dr, St Paul, MN 55114, 651-645-0091, info@cpeworldwide.com, www.cpcworldwide.com

Crane Aerospace & Electronics

(div of Crane Co), 10301 Willows Rd, Redmond, WA 98052, 425-882-3100, power@crane-eg.com, www.interpoint.com

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36 Executive Pk, Suite 150, Irvine, CA 92614, 949-553-2200, info@criticalio.com, www.criticalio.com

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(See ad inside front cover)

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CTT Inc

241 E Java Dr, Sunnyvale, CA 94089, 408-541-0596, sales@cttinc.com, www.cttinc.com

CUI Inc

20050 SW 112th Ave, Tualatin, OR 97062, 503-612-2300, sales@cui.com, www.cui.com

Curtiss-Wright Defense Solutions

(sub of Curtiss-Wright Corp), 20130 Lakeview Ctr Plaza, Suite 200, Ashburn, VA 20147, 703-779-7800, ds@curtisswright.com, www.curtisswrightds.com

Custom Manufacturing & Engineering Inc

3690 70th Ave N, Pinellas Park, FL 33781, 727-547-9799, sales@custom-mfg-eng.com, www.custom-mfg-eng.com

DAC International Inc

6702 McNeil Dr, Austin, TX 78729, 512-331-5323, dacinfo@dacint.com, www.dacint.com

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2850 Lewisberry Rd, York Haven, PA 17370, 717-932-9999, www.makeitdaisy.com

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(See ad page 15)

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dB Control

(sub of HEICO Corp Electronic Technologies Group (ETG)), 1120 Auburn St, Fremont, CA 94538, 510-656-2325, marketing@dbcontrol.com, www.dbcontrol.com

DDC-I Inc

4600 E Shea Blvd, Suite 102, Phoenix, AZ 85028, 602-275-7172, sales@ddci.com, www.ddci.com

Dedicated Computing

N26 W23880 Commerce Cir, Waukesha, WI 53188, 262-951-7200, marketing@dedicatedcomputing.com, www.dedicatedcomputing.com

Delphi Automotive LLP

5725 Delphi Dr, Troy, MI 48098, 248-813-2000, www.delphi.com

Deposition Sciences Inc (DSI)

(sub of Lockheed Martin), 3300 Coffey Ln, Santa Rosa, CA 95403, 707-573-6700, solutions@depsci.com, www.depsci.com

Design Criteria Inc

1821 W 4000 S, Suite 200, Roy, UT 84067, 801-393-1414, power@designcriteria.com, www.designcriteria.com

DeWAL Industries

15 Ray Trainor Dr, Narragansett, RI 02882, 401-789-9736, cbrooks@dewal.com, www.dewal.com

Diamond-MT Inc

213 Chestnut St, Johnstown, PA 15906, 814-535-3505, shorn@diamond-mt.com, www.paryleneconformalcoating.com

Diamond Systems Corp

1255 Terra Bella Ave, Mountain View, CA 94043, 650-810-2514, www.diamondsystems.com

DiCon Fiberoptics Inc

1689 Regetta Blvd, Richmond, CA 94804, 510-620-5200, sales@diconfiberoptics.com, www.diconfiberoptics.com

Digicom Electronics

7799 Pardee Ln, Oakland, CA 94621, 510-639-7003, info@digicom.org, www.digicom.org

Digi-Key Electronics

701 Brooks Ave S, Thief River Falls, MN 56701, 800-344-4539, sales@digkey.com, www.digkey.com

Digital Core Design

Wroclawska 94, Bytom 41-902, Poland, 48-32-282-82-66, info@dcd.pl, www.dcd.pl

Digital Power Corp

48430 Lakeview Blvd, Fremont, CA 94538, 510-657-2635, sales@digipwr.com, www.digipwr.com

DILAS Diode Laser Inc

9070 S Rita Rd, Suite 1500, Tucson, AZ 85747, 520-232-3480, sales@dilas-inc.com, www.dilas.com

DLS Electronic Systems Inc

1250 Peterson Dr, Wheeling, IL 60090, 847-537-6400, jblack@dlsemc.com, www.dlsemc.com

DRS Technologies Inc

2345 Crystal Dr, Suite 1000, Arlington, VA 22202, 703-416-8000, www.drs.com

dSPACE Inc

(div of dSPACE GmbH), 50131 Pontiac Trail, Wixom, MI 48393-2020, 248-295-4700, info@dspaceinc.com, www.dspaceinc.com

DSP Development Corp

1 Bridge St, A301, Newton, MA 02458, 617-969-0185, buck@dadisp.com, www.dadisp.com

Dspnor AS

Laksevagneset 12, Laksevag, Bergen 5160, Norway, 47-55-94-15-15, info@dspnor.no, www.dspnor.com

Duraflex Inc

765 Industrial Dr, Cary, IL 60013, 847-462-1007, info@duraflexinc.com, www.duraflexinc.com

Dynamic Engineering

150 Dubois St, Suite C, Santa Cruz, CA 95060, 831-457-8891, sales@dyneng.com, www.dyneng.com

Dyne Technology Ltd

Newton House, 5 Parkside Ct, Greenhough Rd, Lichfield, Staffordshire WS13 7FE, UK, 44-1543-411-460, info@dyne technology.co.uk, www.dyne technology.co.uk

e2v

Semiconductors Div, 765 Sycamore, Milpitas, CA 95035, 408-240-5211, inquiries@e2v-us.com, www.e2v-us.com

EaglePicher Technologies LLC

C and Porter Sts, PO Box 47, Joplin, MO 64802, 417-623-8000, inquiry.technologies@eaglepicher.com, www.eaglepicher.com

Eagle PLC

(div of MRO Electric and Supply), 1652 Old Apex Rd, Cary, NC 27513, 800-691-8511, sales@eagleplc.com, www.eagleplc.com

EARMARK

1125 Dixwell Ave, Hamden, CT 06514, 888-327-6275, sales@earmark.com, www.earmark.com

Eaton

(Mil/aero Interconnect Products Div), 750 W Ventura Blvd, Camarillo, CA 93010, 805-484-0543, cicustomer.service@eaton.com, www.eaton.com/interconnect

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With 40 years of experience in the embedded market and in serving the most demanding markets, the company is accepted by major contractors as a key partner, and is able to design and deliver on-time, innovative, reliable and durable technical solutions.

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EDT | Engineering Design Team Inc

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11 A/B Chandra Colony, Off CG Rd, Ellisbridge, Ahmedabad, Gujarat 380001, India, 91-79-26563705, marketing@einfochips.com, www.einfochips.com

EIZO Rugged Solutions

442 Northlake Blvd, Altamonte Springs, FL 32701, 407-262-7100, ers-info@eizo.com, www.eizorugged.com

Elbit Systems of America

220 Daniel Webster Hwy, Merrimack, NH 03054, 603-889-2500, www.elbitsystems-us.com

ELDEC

(div of Crane Aerospace & Electronics), 16700 13th Ave W, Lynnwood, WA 98037, 425-743-1313, electronics@crane-eg.com, www.craneae.com

Electrolube

(div of H K Wentworth Ltd), Unit 12, Coalfield Way, Ashby Pk, Ashby de la Zouch, Leicestershire LE65 1JR, UK, 44-1530-419-600, info@electrolube.co.uk, www.electrolube.com

Electro-Mech Components Inc

1826 Floradale Ave, South El Monte, CA 91733-3689, 626-442-7180, info@electromechcomp.com, www.electromechcomp.com

Electronic Development Labs Inc (EDL)

244 Oakland Dr, Danville, VA 24540, 434-799-0807, sales@edl-inc.com, www.edl-inc.com

Electro-Optical Products Corp

PO Box 650441, Fresh Meadows, NY 11365, 718-456-6000, sales@eopc.com, www.eopc.com

■ Elma Electronic Inc

44350 S Grimmer Blvd, Fremont, CA 94538, 510-656-3400, sales@elma.com, www.elma.com

Designs integrated subsystems, rugged chassis, ATRs and board-level solutions for high-performance embedded computing for avionics and defense applications. Standard and rugged VPX, VME, cPCI and SFF processor boards, storage, NAS, networking, I/O and OS support for standard or custom solutions. Is ISO 9001 and AS9100 certified.

(See ad page 29)

Embassy Global

5999 S Park Ave, Suite 144, Hamburg, NY 14075, 800-309-6150, inquiries@embassyglobalpr.com, www.embassyglobal.com



EMCCs Dr Rasek GmbH & Co KG

Boelwiese 8, Ebermannstadt 91320, Germany, 49-9194-7262-0, info@emcc.de, www.emcc.de

Provides electromagnetic environmental effects (E3), one-stop solutions from consulting, R&D to seminars and testing services (inter alia HIRF and impact of indirect and direct lightning effects) according to IEC 61000-4-25, MIL-STD up to RTCA DO-160, VG and more. Accredited services are conducted at the company's test labs or on-site.

EMCOR Government Services

2800 Crystal Dr, Suite 600, Arlington, VA 22202, 571-403-8900, emcor_info@emcor.net, www.emcorgovservices.com

EnergyWatch

1261 Broadway, Suite 510, New York, NY 10001, 212-616-5100, info@energywatch-inc.com, www.energywatch-inc.com

EngineerSupply

21430 Timberlake Rd, Unit 349, Lynchburg, VA 24502, 800-591-8907, customerservice@engineersupply.com, www.engineersupply.com

EO Strategies

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Epec Engineered Technologies

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esd electronics Inc

70 Federal St, Suite 2, Greenfield, MA 01301, 413-772317-0, us-sales@esd-electronics.com, www.esd-electronics.us

Essex Industries

7700 Gravois Rd, St Louis, MO 63123, 314-832-4500, info@essexind.com, www.essexindustries.com

Eureka Dry Tech

(sub of Taiwan Dry Tech Corp), 3F, 59 Sec 4, Xinyi Rd, Taipei 106, Taiwan, 886-2-2755-4545, sales@eurekadrytech.com, www.eurekadrytech.com

EURESYS Inc

(div of EURESYS SA), 27126-B Paseo Espada, Suite 704, San Juan Capistrano, CA 92675, 949-743-0612, sales.america@euresys.com, www.euresys.com

EURESYS SA

Avenue du Pré-Aily, 14, Angleur 4031, Belgium, 32-4-367-72-88, sales.europe@euresys.com, www.euresys.com

■ Evans Capacitor Co

72 Boyd Ave, East Providence, RI 02914, 401-435-3555, chasd@evanscap.com, www.evanscap.com

Manufactures high-energy density capacitors for demanding defense and aerospace applications. Typical applications are high-current pulse (such as phased array radar, LASER, LIDAR) and hold up, in power supplies where quality, reliability, size, and weight, are the factors of component selection. Is ISO 9001, AS9001 and ITAR registered.

(See ad page 6)

Exa Corp

55 Network Dr, Burlington, MA 01803, 781-564-0200, info@exa.com, www.exa.com

Excelitas Canada

Defense Sensors Div, 22001 Dumberry Rd, Vaudreuil-Dorion, QC J7V 8P7, Canada, 450-424-3300, aes.na@excelitas.com, www.excelitas.com

Excelitas Technologies

Power Systems, 1330 E Cypress St, Covina, CA 91724, 626-967-9521, aes.na@excelitas.com, www.excelitas.com

Excelitas Technologies

Energetic Systems, 1100 Vanguard Blvd, Miamisburg, OH 45342, 937-865-3800, aes.na@excelitas.com, www.excelitas.com/pages/product/energetic-systems.aspx

EXFO

400 Godin Ave, Quebec City, QC G1M 2K2, Canada, 418-683-0211, info@exfo.com, www.exfo.com

■ Extreme Engineering Solutions Inc (X-ES)

3225 Deming Way, Suite 120, Middleton, WI 53562, 608-833-1155, sales@xes-inc.com, www.xes-inc.com

Is a leader in the design, manufacture, and support of standard and custom embedded computing solutions. Provides an extensive portfolio of commercial and ruggedized single-board computers (SBCs), I/O, SSD storage, networking, backplanes, enclosures, power modules, and integrated systems.

(See ad page 3, 43)



■ Falcon Electronics

47 Mall Dr, Suite 5, Commack, NY 11725, 800-444-4744, ian@falconelec.com, www.falconelec.com

Distributes military, hi-rel and space-grade semiconductors including ARINC 429/1553 databus products, power supplies, data acquisition circuits, solid-state data storage and full MIL-SMD static RAMs. Supplies companies including API Technologies, Datel, DPACI, FMJ, Holt, Mercury Systems, Microsemi, PDI, Semtech, SMART Modular Technologies, TT electronics, Vishay and Xtreme Semiconductor.

(See ad page 14)

Falcon Electronics

1505 W University Dr, Suite 105, Tempe, AZ 85281, 480-829-1100, ian@falconelec.com, www.falconelec.com

Fastener Specialty Inc

2435 109th St, Grand Prairie, TX 75050-1113, 972-988-0064, sales@fastenerspecialty.com, www.fastenerspecialty.com

Federal Custom Cable

1891 Alton Pkwy, Irvine, CA 92606, 949-851-3114, eli@fccable.com, www.fccable.com

FEI-Zyfer Inc

(sub of Frequency Electronics Inc), 7321 Lincoln Way, Garden Grove, CA 92841-1428, 714-933-4000, dmc@fei-zyfer.com, www.fei-zyfer.com

Fiber Instrument Sales Inc

161 Clear Rd, Oriskany, NY 13424,
315-736-2206,
info@fiberinstrumentsales.com,
www.fiberinstrumentsales.com

Fiberscope.net

(sub of MEDIT), 96 Sherbrook St,
Winnipeg, MB R3C 2B3,
Canada, 800-239-9934,
salesteam@meditinc.com,
www.fiberscope.net

Fibersense & Signals Inc

86 Fenmar Dr, Toronto, ON M9L 1M5,
Canada, sales@fibersensefirst.com,
www.fibersensefirst.com

FiberTek Pte Ltd

Blk 3015A Ubi Rd 1, Suite 04-13,
408705, Singapore, 65-6280-1966,
marketing@fibertek-ap.com,
www.fibertekfibershop.com

Finetech

560 E Germann Rd, Suite 103, Gilbert,
AZ 85297, 480-893-1180,
www.finetechusa.com

First Level Inc

3109 Espresso Way, York, PA 17406,
717-266-2450, info@firstlevelinc.com,
www.firstlevelinc.com

First Sensor Inc

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02048, 508-339-2955,
us@first-sensor.com,
www.first-sensor.com

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678-393-5400,
mail@fischerconnectors.com,
www.fischerconnectors.com

FLIR Systems Inc

27700A SW Parkway Ave, Wilsonville,
OR 97070, 503-498-3457,
david.strong@flir.com, www.flir.com/gs

Foremay

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Suite 300, Pasadena, CA 92821,
408-228-3468, pr@foremay.net,
www.foremay.net

Forza Silicon

2947 Bradley St, Suite 130, Pasadena,
CA 91107, 626-796-1182,
info@forzasilicon.com,
www.forzasilicon.com

FoxFury Lighting Solutions

3528 Seagate Way, Suite 100,
Oceanside, CA 92056, 760-945-4231,
marketing@foxfury.com,
www.foxfury.com

Frankfurt Laser Co

An den 30 Morgen 13, Friedrichsdorf
61381, Germany, 49-6172-27978-0,
sales@frlaserco.com, www.frlaserco.com

FSP Group USA

14284 Albers Way, Chino, CA 91710,
909-606-0960, info@fspgroupusa.com,
www.fspgroupusa.com

Fuel Quality Services Inc

4584 Cantrell Rd, PO Box 1380,
Flowery Branch, GA 30542,
770-967-9790, sales@fqsync.com,
www.fqsync.com

■ Gaia Converter

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H7L 5R2, Canada, 514-333-3169,
salesus@gaia-converter.com,
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power architectures. Designs and
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DO-160 or equivalent standards.*

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GammaTech Computer Corp

48329 Fremont Blvd, Fremont, CA
94538, 800-995-8946,
marketing@gammatechusa.com,
www.gammatechusa.com

Ganzhou Great Magnet Technology Co Ltd

114, Gantong Rd, HK Industrial Pk,
Ganzhou, Jiangxi 341000,
China, 86-797-7373806,
greatmagnet@jucikeji.com,
www.jucikeji.com/?en/

GDCA Inc

1799 Portola Ave, Livermore, CA 94551,
925-456-9900, sales@gdca.com,
www.gdca.com

General Atomics Aeronautical Systems Inc

14200 Kirkham Way, Poway, CA 92064,
858-312-2810, pr-asi@ga-asi.com,
www.ga-asi.com

General Dynamics C4 Systems

8201 E McDowell Rd, Scottsdale, AZ
85257, 480-441-3033,
info@gdc4s.com, www.gdc4s.com

General Micro Systems Inc

8358 Maple Pl, Rancho Cucamonga, CA
91730, 909-980-4863,
www.gms4sbc.com

Getac

43 Tesla, Irvine, CA 92618,
949-681-2900,
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www.us.getac.com

GEViCAM Inc

691 S Milpitas Blvd, Suite 115, Milpitas,
CA 95035, 408-945-9900,
info@gevicam.com, www.gevicam.com

Giga-tronics Inc

4650 Norris Canyon Rd, San Ramon, CA
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Global Training Solutions Inc

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26067, Mississauga, ON L5L 5W7,
Canada, 416-806-5777,
info@globaltrainingsolutions.ca,
www.globaltrainingsolutions.ca

Go4Fiber Ltd

3/F Tung Lee Bldg, 9 Lai Yip St, Kwun
Tong, Hong Kong, 852-2174-1338,
sales_group@go4fiber.com,
www.go4fiber.com

Godlan Inc

15399 Canal Rd, Clinton Township, MI
48038, 586-464-4400,
info@godlan.com, www.godlan.com

GPS Source Inc

64 Mission Dr, Pueblo West, CO 81007,
719-561-9520, sales@gpssource.com,
www.gpssource.com

Graham Magnetics

Aerospace Div, 1715 4th St, Graham, TX
76450, 530-906-0056,
robert@datatapes.biz,
www.grahamindustry.net

Graphic Products

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97005, 888-326-9244,
info@graphicproducts.com,
www.graphicproducts.com

Great River Technology

4910 Alameda Blvd NE, Albuquerque,
NM 87113, 505-881-6262,
sales@greatrivertech.com,
www.greatrivertech.com

Green Hills Software Inc

30 W Sola St, Santa Barbara, CA 93101,
805-965-6044, info@ghs.com,
www.ghs.com

G-S PLASTIC OPTICS

408 St Paul St, Rochester, NY 14605,
585-295-0200, info@gsoplastics.com,
www.gsoplastics.com

Guernsey Coating Laboratories Inc

1788 Goodyear Ave, Ventura, CA 93003,
805-642-1508,
sales@guernseycoating.com,
www.guernseycoating.com

HALT and HASS Labs

(sub of Ops A La Carte), 990 Richard Ave,
Suite 101, Santa Clara, CA 95050,
408-654-0499, mikes@opsalacarte.com,
www.haltandhasslabs.com

Handling Specialty Manufacturing Ltd

(sub of Whiting Equipment Canada),
219 S Service Rd W, Grimsby, ON
L3M 1Y6, Canada, 905-945-9661,
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www.handling.com

H&L Instruments LLC

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603-964-1818,
rlandman@hlinstruments.com,
www.hlinstruments.com

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03079, 603-893-5376,
mis@harwin.com, www.harwin.com

Haydon Kerk Motion Solutions Inc

(sub of AMETEK), 1500 Meriden Rd,
Waterbury, CT 06705, 203-756-7441,
info.haydonkerk@ametek.com,
www.haydonkerk.com

HDL Research Lab Inc

406 W Blue Bell Rd, PO Box 2108,
Brenham, TX 77834-2108,
979-836-2300, sales@hdlpower.com,
www.hdlpower.com

Henniker Plasma

Unit B3, Trident Business Pk, Daten Ave,
Warrington, Cheshire WA3 6AX, UK,
44-1925-830-771,
info@plasmamatreatment.co.uk,
www.plasmamatreatment.co.uk

Hexion Inc

Epoxy, Phenolic & Coating Resins Div,
180 E Broad St, Columbus, OH 43215,
614-225-4000,
4information@hexion.com,
www.hexion.com

High Energy Devices LLC

26 Hollenberg Ct, Bridgeton, MO 63044,
314-291-0030,
info@highenergydevices.com,
www.highenergydevices.com

Hirox-USA Inc

100 Commerce Way, Hackensack, NJ
07601, 201-342-2600,
info@hirox-usa.com, www.hirox-usa.com

Hitex GmbH

Greschbachstr 12, Karlsruhe D-76229,
Germany, 49-721-9628-0,
sales@hitex.de, www.hitex.com

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Supplies ICs for avionics and military data bus applications. Offers a wide range of ARINC 429 products, MIL-STD-1553 BC/RT/MT protocol ICs, transceivers and transformers. Other IC offerings include ARINC 825 (CAN), ARINC 717, RS-485/422, analog switches and discrete-to-digital sensing. Products are specified by more than 400 avionics manufacturers worldwide.

(See ad page 57)

Honeywell Aerospace

1944 E Sky Harbor Cir, PO Box 2102-103, Phoenix, AZ 85034, 800-601-3099, customerservice@honeywell.com, www.honeywell.com

Hughes Circuits Inc

544 S Pacific St, San Marcos, CA 92078, 760-744-0300, sales@hughescircuits.com, www.hughescircuits.com

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IBI Systems Inc

6842 NW 20th Ave, Ft Lauderdale, FL 33309, 954-978-9225, ibisys@aol.com, www.ibi-systems.com

Icron Technologies Corp

4664 Lougheed Hwy, Suite 221, Burnaby, BC V5C 5T5, Canada, 604-638-3920, info@icron.com, www.icron.com

IEH Corp

140 58th St, Suite 8E, Brooklyn, NY 11220, 718-492-4448, ieh@iehcorp.com, www.iehcorp.com

II-VI Inc

375 Saxonburg Blvd, Saxonburg, PA 16056, 724-352-4455, info@ii-vi.com, www.ii-vi.com

Impact Technical Services Ltd

3 Kingsley St, Leicester LE2 6DY, UK, 44-116-244-8855, enquiries@impactts.co.uk, www.impacttechnicalservices.co.uk

Impulse Accelerated Technologies

4019 131st Pl SE, Bellevue, WA 98006, 425-605-9543 x108, info@impulseaccelerated.com, www.impulseaccelerated.com

Industrial Training Consultants Inc

2969 Hwy 11, Pelham, AL 35124, 205-663-4960, contact@itctrng.com, www.itctrng.com

Infinite Optics Inc

1712 Newport Cir, Suite F, Santa Ana, CA 92075-5118, 714-557-2299, stan@infiniteoptics.com, www.infiniteoptics.com

Infolytica Corp

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INICORE Inc

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InnovaQuartz LLC

23030 N 15th Ave, Phoenix, AZ 85027-1315, 624-434-1895, info@innovaquartz.com, www.innovaquartz.com

Innovasic Inc

5635 Jefferson St NE, Suite A, Albuquerque, NM 87109, 505-883-5263, sales@innovasic.com, www.innovasic.com

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Is one of the world's leading suppliers of DSP and data acquisition solutions. The company offers a product portfolio unrivaled in its depth and its range of performance and I/O capabilities.

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Integrated Dispensing Solutions Inc

5311 Derry Ave, Bldg D, Agoura Hills, CA 91301, 818-597-4300, service@dispensinglink.com, www.dispensinglink.com

IntelliPower Inc

1746 N St Thomas Cir, Orange, CA 92865, 714-921-1580, sales@intellipower.com, www.intellipower.com

Interconnect Systems Inc

759 Flynn Rd, Camarillo, CA 93012-8056, 805-482-2870, info@isipkg.com, www.isipkg.com

■ Interface Concept

3, Rue Felix Le Dantec, Quimper 29000, France, 33-2-98-57-30-30, info@interfaceconcept.com, www.interfaceconcept.com

Designs, develops and manufactures embedded COTS boards and systems for industrial and defense markets. Provides a product portfolio of Ethernet switches, IP routers, front-end/back-end processing boards (CPU, GPU, FPGA and I/O), operating from standard to conduction-cooled grades. Custom design, integration and support are part of the company's services.

(See ad page 18)

Interpoint

(div of Crane Aerospace & Electronics), 10301 Willows Rd NE, Redmond, WA 98052, 425-882-3100, power@crane-eg.com, www.craneae.com/interpoint

Intersil

1001 Murphy Ranch Rd, Milpitas, CA 95035, 408-432-8888, www.intersil.com



■ Interstate Connecting Components

(div of Heilind Electronics), 120 Mount Holly Bypass, Lumberton, NJ 08048, 800-422-3911, sales@connecticc.com, www.connecticc.com

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(See ad inside back cover)

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IO Industries Inc

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IRCameras LLC

30 S Calle Cesar Chavez, Suite D, Santa Barbara, CA 93103, 877-472-2637, sales@ircameras.com, www.ircameras.com

IR HiRel - An Infineon Technologies Co

101 N Sepulveda Blvd, El Segundo, CA 90245, 310-726-8000, www.infineon.com/hirel

Ironwood Electronics

1335 Eagandale Ct, Eagan, MN 55121, 952-229-8200, info@ironwoodelectronics.com, www.ironwoodelectronics.com

Iscan Inc

21 Cabot Rd, Woburn, MA 01801, 781-932-1199, info@iscaninc.com, www.iscaninc.com

ISVI Corp

103-808 SK Ventium Bldg, 166 Gosan-Ro, Gunpo-si, Gyeonggi-do 15850, South Korea, 82-31-427-3245, sales@isvi-corp.com, www.isvi-corp.com

ITT Interconnect Solutions

666 E Dyer Rd, Santa Ana, CA 92705, 714-628-8277, shields.grant@itt.com, www.ittcannon.com

Jama Software

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310-320-3088, www.poc.com

Pickering Interfaces Inc

221 Chelmsford St, Suite 6, Chelmsford,
MA 01824, 781-897-1710,
ussales@pickeringtest.com,
www.pickeringtest.com

■ PICO Electronics Inc

143 Sparks Ave, Pelham, NY
10803, 914-738-1400,
info@picoelectronics.com,
www.picoelectronics.com

*Manufactures military, COTS,
and industrial DC/DC converters,
high-voltage modules, AC/DC power
supplies, inductors, and transformers.
MIL-PRF units, environmental
screening, and custom specifications
are available from an ISO
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(See ad page 1, 7)

PIC Wire & Cable

(sub of The Angelus Corp),
N53 W24747 S Corporate Cir, Sussex, WI
53089-0330, 262-246-0500,
sales@picwire.com, www.picwire.com

Pixus Technologies

50 Bathurst Dr, Waterloo, ON N2V 2C5,
Canada, 519-885-5775,
sales@pixustechnologies.com,
www.pixustechnologies.com

Pleora Technologies Inc

340 Terry Fox Dr, Suite 300, Ottawa, ON
K2K 3A2, Canada, 613-270-0625,
info@pleora.com, www.pleora.com

■ Positronic

423 N Campbell Ave, Springfield,
MO 65806-1007, 417-866-2322,
info@connectpositronic.com,
www.connectpositronic.com

*Manufactures high-reliability
power connectors, D-subminiature
connectors, rectangular connectors,
and circular connectors. Offers many
performance options, including
mil-spec and space flight. Has
supported military electronics for
more than 40 years. The company
offers customer support through
detailed catalogs, easy-to-use website
and local technical customer service.*

(See ad page 53)

Powell Electronics

200 Commodore Dr, Swedesboro, NJ
08085, 800-235-7880,
info@powell.com, www.powell.com

Power Inverter Inc

8221 W Sunset Blvd, Los Angeles, CA
90001, 310-642-1113,
kimmy@powerinverter.org,
www.powerinverter.org

Princeton Infrared Technologies Inc (PIRT)

9 Deerpark Dr, Suite J-5, Monmouth
Junction, NJ 08552, 609-917-3380,
sales@princetonirtech.com,
www.princetonirtech.com

Princeton Lightwave Inc

2555 US Rt 130 S, Suite 1, Cranbury, NJ
08512, 609-495-2600,
sales@princetonlightwave.com,
www.princetonlightwave.com

Printed Circuits Inc

1200 W 96th St, Minneapolis, MN
55431-2699, 952-888-7900,
bburns@printedcircuits.com,
www.printedcircuits.com

PrismTech

400 TradeCenter, Suite 5900, Woburn,
MA 01801, 781-569-5819,
info@prismtech.com,
www.prismtech.com



Projects Unlimited

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937-918-2207, contact@pui.com,
www.pui.com

*Is a contract manufacturer of
electronics manufacturing services
(EMS) for circuit-card assemblies,
box build electronics systems, and
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aerospace and defense companies
worldwide. Is ITAR-registered,
small business, AS9100C, ISO
9001:2008, NADCAP-Electronics
certified, and manufactures to
J-STD-001 Class 3, IPC-A-610, and
IPC/WHMA-A-620 standards.*

Pryme

911 Mariner St, Brea, CA 92821,
714-257-0300,
sales.service@pryme.com,
www.pryme.com

PTC

140 Kendrick St, Needham, MA 02494,
781-370-5000, www.ptc.com

PulseTech Products Corp

1100 S Kimball Ave, Southlake, TX
76092, 817-329-6099,
ppc@pulsetech.net, www.pulsetech.net

QSDM Inc

6470 Kestrel Rd, Mississauga, ON
L5T 1Z7, Canada, 905-565-1800,
marketing@qsdm.com, www.qsdm.com

Quality Consultants International Inc

7911 Dogwood Rd, Windsor Mill, MD
21244-1205, 410-298-9663,
qciart@aol.com

Qualmark Corp

(div of ESPEC Corp), 10390 E 48th Ave,
Denver, CO 80238, 303-254-8800,
sales@qualmark.com,
www.qualmark.com

Quell Corp

5639 Jefferson St NE, Albuquerque, NM
87109, 505-243-1423,
eeseal@quell.us, www.eeseal.com

Quicklogic Corp

1277 Orleans Dr, Sunnyvale, CA
94089-1138, 408-990-4000,
www.quicklogic.com

Radiant Vision Systems

22908 NE Alder Crest Dr, Suite 100,
Redmond, WA 98053,
425-844-0152, info@radiantvs.com,
www.radiantvisionsystems.com

Radiency Technologies

307 City Arcade, Near DSP Bungalow,
Teen Batti, Jamnagar, Gujarat
361001, India, 91-288-3013025,
info@radiency.com, www.radiency.com

Radio IP Software Inc

1111 St Charles W, Suite 555, E Tower,
Montreal, QC J4K 5G4, Canada,
514-890-6070, marketing@radio-ip.com,
www.radio-ip.com

Radisys

5435 NE Dawson Creek Dr, Hillsboro, OR
97124, 503-615-1100,
info@radisys.com, www.radisys.com

■ R&D Interconnect Solutions

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*Provides high-performance elastomer
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(See ad page 17)

Rantec Power Systems Inc

1173 Los Olivos Ave, Los Osos, CA
93402, 805-596-6000,
powersys@rantec.com, www.rantec.com

Rapid Imaging Software Inc

2201 Buena Vista Dr, Suite 422,
Albuquerque, NM 87106,
608-824-1131, sales@rapidimaging.net,
www.rapidimaging.net

Raytheon Vision Systems

75 Coromar Dr, Goleta, CA
93117-3090, 805-968-3511,
rvsmarketing@raytheon.com,
www.raytheon.com/businesses/ncs/rvs

R Blaine Industries Inc

Polyimide & Hybrid Polymers Div, 1517
Hill Rd, Suite 5F, Reading, PA 19602,
610-236-1445, info@vtecp.com,
www.rblaine.com

Real-Time Innovations

385 Moffett Pk Dr, Sunnyvale, CA
94089, 408-990-7400,
info@rti.com, www.rti.com



Red Rapids

797 N Grove Rd, Suite 101, Richardson,
TX 75081, 972-671-9570,
sales@redrapids.com,
www.redrapids.com

*Offers a catalog of signal acquisition
and generation hardware products
that are targeted at communication,
telemetry, radar and surveillance
systems. Products include signal
converters, transmitters, receivers
and FPGA DSP accelerators. All of
the products are built around open
architecture standards for embedded
systems (XMC/VPX/cPCI) and
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Rennsteig Tools Inc

411 Hackensack Ave, 2nd Fl, Hackensack,
NJ 07601, 330-315-3044,
info@rennsteig.us, www.rennsteig.us

Resolved Analytics

810 Vickers Ave, Durham, NC
27701, 704-559-9560,
info@resolvedanalytics.com,
www.resolvedanalytics.com

Reynard Corp

1020 Calle Sombra, San Clemente, CA
92673, 949-366-8866,
sales@reynardcorp.com,
www.reynardcorp.com

■ RGB Spectrum

950 Marina Village Pkwy, Alameda,
CA 94501, 510-814-7000,
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*Provides display processing, recording,
and signal distribution solutions,
specializing in command-and-control,
simulation, and training. Products
include multiviewers, multiscreen
display processors, JPEG 2000
codecs and recorders, DVI matrix
switches, and scan converters.*

(See ad page 40)

Robotics Design Inc

2100 Guy St, Suite 200A, Montreal, QC H3H 2M8, Canada, 514-223-2540, steve.sc@roboticsdesign.qc.ca, www.roboticsdesign.ca

Rockwell Automation Inc

1201 S Second St, Milwaukee, WI 53204-2496, 414-382-2000, www.rockwellautomation.com

Rockwell Collins

1822 Deere Ave, Irvine, CA 92606, 949-221-5329, www.rockwellcollins.com

RPMC Lasers Inc

203 Joseph St, O'Fallon, MO 63366, 636-272-7227, rpmc@rpmclasers.com, www.rpmclasers.com

RTF Manufacturing LLC

793 Rt 66, Hudson, NY 12534, 800-836-0744, info@rtfmanufacturing.com, www.rtfmanufacturing.com

RWC Testing & Lab Supplies

1821 N Zaragosa Rd, PMB 640, El Paso, TX 79936, 915-852-3375, customerservice@rwc-testing.com, www.rwc-testing.com

Saelig Co Inc

71 Perinton Pkwy, Fairport, NY 14450, 585-385-1750, sales@saelig.com, www.saelig.com

Safety Equipment Corp

1141 Old County Rd, Belmont, CA 94002, 650-595-5422, info@safetysafetyequipmentcorp.com, www.gascabinets.com

Safran Reosc

(div of Safran Electronics & Defence), Ave de la Tour Maury, St Pierre du Perray 91280, France, 33-1-69-89-72-00, www.safran-reosc.com

Sagax Communications

Vaci u 47, Budapest 1053, Hungary, 36-1-788-3358, sales@sagax.hu, www.sagax.hu

Saline Llectronics

710 N Maple Rd, Saline, MI 48176, 734-944-2120, dmcdonnell@electronics.net, www.lectronics.net

Sandel Avionics

2401 Dogwood Way, Vista, CA 92081, 760-727-4900, sales@sandel.com, www.sandel.com

Santa Barbara Imaging

396 S San Marcos Rd, Santa Barbara, CA 93111, 805-729-0422, sales@santabarbaraimaging.com, www.santabarbaraimaging.com

Screening Systems Inc

1999 S Bascom Ave, Suite 700, Campbell, CA 95008, 949-855-1751, sales@scrsys.com, www.scrsys.com

Sealing Devices Inc

4400 Walden Ave, Lancaster, NY 14086, 716-684-7600, seals@sealingdevices.com, www.sealingdevices.com

SENER

c/ Severo Ochoa 4, Parque Tecnológico de Madrid, Tres Cantos, Madrid 28760, Spain, 34-918-07-70-00, info@sener.es, www.sener-group.com

Sensitron Semiconductor

(div of RSM Electron Power Inc), 221 W Industry Ct, Deer Park, NY 11729-4681, 631-586-7600, sales@sensitron.com, www.sensitron.com

Sensors Unlimited Products

(div of UTC Aerospace Systems), 330 Carter Rd, Suite 100, Princeton, NJ 08540, 609-333-8200, sui_sales@utas.utc.com, www.sensorsinc.com

Servometer

501 Little Falls Rd, Cedar Grove, NJ 07009-1291, 973-785-4630, info@servometer.com, www.servometer.com

Shakespeare Military Antenna Products

6111 Shakespeare Rd, Columbia, SC 29223, 803-728-9517, deyoung@jardenmaterials.com, www.shakespeare-military.com

SHENMAO America Inc

2156 Ringwood Ave, San Jose, CA 95131, 408-943-1755, watson_tseng@shenmao.us, www.shenmao.com

Shenzhen Refond Optoelectronics Co Ltd

Bldg 1, 10th Industrial Zone, Tian Liao Community, Guangming New Dist, Shenzhen, Guangdong 518132, China, 86-755-6683-9118, sales@refond.com, www.refond.com

Shoghi Communications

74 Electronic Complex, Industrial Area Shoghi, Shimla, Himachal Pradesh 173219, India, 91-177-2860630, marketing@shoghicom.com, www.shoghicom.com

Siemens PLM Software

60 Broadhollow Rd, Melville, NY 11747, 631-549-2300, info@cd-adapco.com, <http://mdx.plm.automation.siemens.com>

Siemens PLM Software

5800 Granite Pkwy, Suite 600, Plano, TX 75024-6612, 972-987-3000, info.plm@siemens.com, www.plm.automation.siemens.com

Siemens Process Industries and Drives

3333 Old Milton Pkwy, Alpharetta, GA 30005, 770-751-2000, help@siemens.com, www.usa.siemens.com/industry

Sierra-Olympic Technologies Inc (SOTI)

(sub of Hood Technology Corp), 3100 Cascade Ave, Hood River, OR 97031, 541-716-0016, chris@sierraolympic.com, www.sierraolympic.com

Sierra Pacific Innovations

6620 S Tenaya Way, Suite 200, Las Vegas, NV 89113, 702-369-3966, sales@x20.org, www.x20.org

Signal Technology

(div of Crane Aerospace & Electronics) (sub of Crane Co), 340 N Roosevelt Ave, Chandler, AZ 85226, 480-961-6269, mw@crane-eg.com, www.craneae.com/mw

Silicon Designs Inc

13905 NE 128th St, Kirkland, WA 98034, 425-391-8329, sales@silicondesigns.com, www.silicondesigns.com

Silicon Radar GmbH

Im Technologiepark 1, Frankfurt Oder, Brandenburg 15236, Germany, 49-335-557-17-60, info@siliconradar.com, www.siliconradar.com

SME

1 SME Dr, Dearborn, MI 48128, 313-425-3000, service@sme.org, www.sme.org

Soliton Devices Inc

3301 Electronics Way, Suite C, West Palm Beach, FL 33407, 561-848-4311, sales@solitrondevices.com, www.solitrondevices.com

Southwest Antennas

8145 Ronson Rd, Suite B, San Diego, CA 92111, 858-277-3300, sales@southwestantennas.com, www.southwestantennas.com

Southwest Microwave

Microwave Products Div, 9055 S McKemy St, Tempe, AZ 85284, 480-783-0201, connectors@southwestmicrowave.com, www.southwestmicrowave.com/interconnect

SpaceAge Control Inc

38850 20th St E, Palmdale, CA 93550, 661-273-3000, email@spaceagecontrol.com, www.spaceagecontrol.com

Space Electronics Ltd

Unit 12, Ave Fields, Stratford upon Avon, Warwickshire CV37 0HT, UK, 44-1789-269-179, info@space-electronics.co.uk, www.space-electronics.co.uk

Specialised Imaging Inc

41690 Enterprise Cir N, Suite 104, Temecula, CA 92590, 951-296-6406, frank@specialised-imaging.com, www.specialised-imaging.com

Specialised Imaging Ltd

Silk Mill Industrial Estate, Unit 32, Brook St, Tring, Herts SP23 5EF, UK, 44-1442-827-728, wai@specialised-imaging.com, www.specialised-imaging.com

Specialty Coating Systems

(div of KISCO), 7645 Woodland Dr, Indianapolis, IN 46278, 317-244-1200, scsales@scscoatings.com, www.scscoatings.com

Spectracom

(div of Orolia Group), 1565 Jefferson Rd, Suite 460, Rochester, NY 14623, 585-321-5800, sales@spectracom.com, www.spectracom.com

Speel Praha Ltd

Beranovych 130, Prague 19905, Czech Republic, 420-286-923-619, larbi.ouchelouche@speel.cz, www.speel.cz

SPI Lasers UK Ltd

6 Wellington Pk, Tollbar Way, Hedge End, Southampton SO30 2QU, UK, 44-1489-779-696, sales@spilasers.com, www.spilasers.com

Sporian Microsystems Inc

515 Courtney Way, Suite B, Lafayette, CO 80026, 303-516-9075, info@sporian.com, www.sporian.com

S-Products Inc

9919 Valley View Rd, Eden Prairie, MN 55344, 952-426-0886, s-products@usa.net, www.s-products.com

StacoSystems

7 Morgan, Irvine, CA 92618, 949-297-8700, sales@stacosystems.com, www.stacosystems.com

Stars Lighting Inc

301 Songpa-gu, Bangi-dong, Seoul 138-050, South Korea, 82-10-6430-5852, youngintrading@gmail.com

Statek Corp

512 N Main St, Orange, CA 92868, 714-639-7810, sales@statek.com, www.statek.com

Sterling Precision Optics Inc

1916 Greenleaf St, Evanston, IL 60202,
847-864-6900,
frank@sterlingprecision.com,
www.sterlingprecision.com

Sting Ray Optics LLC

310 Marlboro St, 2nd Fl, Keene, NH
03431, 603-358-5577,
info@stingrayoptics.com,
www.stingrayoptics.com

STMicroelectronics Inc

30 Corporate Dr, Suite 300, Burlington,
MA 01803, 781-861-2650,
carol.brown@st.com, www.st.com

Stock-Point Electronics Inc

9576 Topanga Canyon Blvd, Chatsworth,
CA 91311-4011, 818-718-4100,
www.stock-point.com

Stratign

PO Box 124010, Dubai 124010,
United Arab Emirates, 97-14-2995886,
www.stratign.com

Streamline Circuits Corp

1401 Martin Ave, Santa Clara, CA
95050, 877-264-0343,
ddimick@streamlinecircuits.com,
www.streamlinecircuits.com

Sundance Multiprocessor Technology Ltd

Chiltren House Waterside, Chesham,
Bucks HP5 1PS, UK, 44-1494-793-167,
sales@sundance.com,
www.sundance.com

SurplusEQ.com

329 W Melinda Ln, Phoenix, AZ 85027,
623-581-9777, info@surplusseq.com,
www.surplusseq.com

SV Microwave

(div of Amphenol), 2400 Centrepark W
Dr, West Palm Beach, FL 33409,
561-840-1800, sales@svmicro.com,
www.svmicrowave.com

SwissOptic AG

(sub of Berliner Glas Group),
Heinrich-Wild-Str, Heerbrugg,
Kanton St Gallen CH 9435,
Switzerland, 41-71-727-3074,
swissoptic@swissoptic.com,
www.swissoptic.com

Syntec Optics

515 Lee Rd, Rochester, NY 14606,
585-768-2513, sales@syntecoptics.com,
www.syntecoptics.com

SYSGO

Am Pfaffenstein 14, Klein-Winternheim
55270, Germany, 49-6136-99480,
info@sysgo.com, www.sysgo.com

Systel Rugged Computers

1655 Industrial Blvd, Sugar Land, TX
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www.systelusa.com

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Systron Donner Inertial

(sub of Custom Sensors & Technologies (CST)), 2700 Systron Dr, Concord, CA
94518, 925-979-4400,
sales@systron.com, www.systron.com

Tadiran Batteries

2001 Marcus Ave, Suite 125E,
Lake Success, NY 11042, 516-621-4980,
sjacobs@tadiranbat.com,
www.tadiran.com

TallannQuest

13140 Coit Rd, Suite 212, Dallas, TX
75240, 248-797-5907,
eric@tallannquest.com,
www.tallannquest.com

Tamagawa Electronics Co Ltd

3-11-23 Kamitsuchidana, Ayase-Shi,
Kanagawa 252-1113, Japan,
81-467-76-2293, eigyoubu@tmex.co.jp,
www.tmele.jp

Tango Wave

320 Soquel Way, Sunnyvale, CA 94085,
408-755-1800, sales@tango-wave.com,
www.tango-wave.com

TASC Technical & Assembly Services Corp

Electronic Equipment Manufacturing Div,
2222 N Pacific St, Seattle, WA 98103,
206-682-2967, mhirst@tasc-wa.com,
www.tasc-wa.com

TDK-Lambda Americas

(sub of TDK Corp), 405 Essex Rd,
Neptune, NJ 07753, 732-922-9300,
andy.tydeman@us.tdk-lambda.com,
www.us.tdk-lambda.com/hp

TDK-Lambda Americas

Low Power Div, (sub of TDK Corp),
3055 Del Sol Blvd, San Diego,
CA 92154, 619-575-4400,
marcom@us.tdk-lambda.com,
www.us.tdk-lambda.com/lp

Tech-Etch Inc

45 Aldrin Rd, Plymouth, MA 02360,
508-747-0300, sales@tech-etch.com,
www.tech-etch.com

Tech Products Inc

105 Willow Ave, Staten Island, NY
10305, 718-442-4900,
eorders@techproducts.com,
www.techproducts.com

Techsil Ltd

34 Bidavon Industrial Estate, Waterloo
Rd, Bidford-on-Avon B50 4JN, UK,
44-1789-773-232,
technical@techsil.co.uk,
www.techsil.co.uk

TE Connectivity

MS 258-23, PO Box 3608, Harrisburg, PA
17105-3608, 800-522-6752,
www.te.com

Tef Cap Industries

1155 Phoenixville Pike, Suite 103,
West Chester, PA 19380, 610-692-2576,
tefcapind@tefcap.com, www.tefcap.com

Tektronix Component Solutions

2905 SW Hocken Ave, Beaverton, OR
97005, 503-627-4133,
components@tektronix.com,
www.component-solutions.
tektronix.com

Teledyne LeCroy

(div of Teledyne Technologies),
700 Chestnut Ridge Rd, Chestnut Ridge,
NY 10977, 845-425-2000,
contact.corp@teledynelecroy.com,
www.teledynelecroy.com

Teledyne Microelectronics

1425 Higgs Rd, Lewisburg, TN
37091, 931-359-4531,
microelectronics@teledyne.com,
www.teledynemicro.com

Teledyne Storm Microwave

(sub of Teledyne Technologies Inc),
10221 Werch Dr, Woodridge,
IL 60517, 630-754-3300,
storm_microwave@teledyne.com,
www.teledynestorm.com

TenCate Advanced Composites

18410 Butterfield Blvd, Morgan Hill, CA
95037, 408-776-0700,
info@tcac-usa.com,
www.tencateadvancedcomposites.com

TEN TECH LLC

5777 W Century Blvd, Suite 830,
Los Angeles, CA 90045-5664,
424-704-3235, info@tentechllc.com,
www.tentechllc.com

Teradyne

700 Riverpark Dr, North Reading, MA
01864, 978-370-2700,
www.teradyne.com

TeraXion Inc

2716 Einstein St, Quebec City, QC
G1P 4S8, Canada, 418-658-9500,
info@teraxion.com, www.teraxion.com

Themis Computer

47200 Bayside Pkwy, Fremont, CA
94538, 510-252-0870,
info@themis.com, www.themis.com

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(See ad page 47)

Thermacore Inc

780 Eden Rd, Lancaster, PA 17601,
717-569-6551, info@thermacore.com,
www.thermacore.com

Thermo Scientific - CIDTEC

(div of Thermo Fisher Scientific),
101 Commerce Blvd, Liverpool, NY
13088-4507, 315-451-9410,
tony.chapman@thermofisher.com,
www.thermofisher.com/cidtec

Thermoteknix Systems Ltd

Teknix House, 2 Pembroke Ave,
Waterbeach, Cambridge CB25 9QR,
UK, 44-1223-204-000,
sales@thermoteknix.com, www.
thermoteknix.com

TNC Optics & Technologies Pte Ltd

Blk 3015A Ubi Rd 1 #04-08/10,
Kampong Ubi Industrial Estate,
408705, Singapore, 65-674-46912,
sales@tncoptics.com,
www.tncoptics.com

Topps Safety Apparel Inc

2516 E State Rd, Suite 14, PO Box 750,
Rochester, IN 46975, 574-223-4311,
info@toppsafetyapparel.com,
www.toppsafetyapparel.com

Toshiba Imaging Systems Div

(div of Toshiba America Information
Systems (TAIS), 9740 Irvine Blvd,
Irvine, CA 92618-1697, 810-357-5022,
gary.pitre@toshiba.com,
www.toshibacameras.com

Total Crane Systems Inc

2225 Kenmore Ave, Suite 104,
Buffalo, NY 14207, 800-699-9405,
info@totalcrane.com,
www.totalcrane.com

TRAXPayroll

740 Alfred Nobel Dr, Hercules, CA
94547, 866-611-5410,
sales@traxpayroll.com,
www.traxpayroll.com

Trenton Systems Inc

1725 MacLeod Dr, Lawrenceville, GA
30043-7874, 770-287-3100,
sales@trentonsystems.com,
www.trentonsystems.com

Trion Technology

2131 Sunnyside Blvd, Clearwater, FL
33765, 727-461-1888,
info@triontech.com, www.triontech.com

TriQuint Semiconductor

2300 NE Brookwood Pkwy, Hillsboro, OR
97124, 503-615-9000,
info@tqs.com, www.triquint.com

TSC

Systems Development and Production Div,
(div of Technology Service Corp),
310 Voyager Way NW, Huntsville, AL
35806, 256-535-2100,
products@tsc.com, www.tsc.com

TTI Inc

2441 Northeast Pkwy, Ft Worth, TX
76106-1896, 817-740-9000,
information@ttiinc.com, www.ttiinc.com

TÜV SÜD America Inc

(sub of TÜV SÜV AG), 1775 Old Hwy 8,
Suite 104, New Brighton, MN 55112,
866-362-2376, info@tuvam.com,
www.tuv-sud-america.com

TXO Systems Ltd

Unit 3, Newhouse Farm Industrial Estate,
Chepstow NP16 6UP, UK,
44-129-162-3813,
info@txo-systems.com,
www.txo-systems.com

ULO Optics Ltd

Unit 2, Caxton Pl, Caxton Way,
Stevenage SG1 2UG, UK,
44-1468-767-500, info@ulooptics.com,
www.ulooptics.com

Ultraview Corp

808 Gilman St, Berkeley, CA 94710,
925-253-2960,
sales@ultraviewcorp.com,
www.ultraviewcorp.com

United Electronic Industries Inc

27 Renmar Ave, Walpole, MA 02081,
508-921-4600, info@ueidaq.com,
www.ueidaq.com

US Dynamics Corp

425 Bayview Ave, Amityville, NY 11701,
631-842-5600,
sales@usdynamicscorp.com,
www.usdynamicscorp.com

UTC Aerospace Systems

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