Marvin Test Solutions MTS-3060A SmartCan with kit.

SPECIAL REPORT

ENHANCING TEST IN DEFENSE AND AEROSPACE

By Rick Nelson, Contributing Technical Editor

Customers in the military/aerospace test market are looking for a combination of flexibility, sustainability, high performance, and low cost, often achieved through deployment of commercial-off-the-shelf (COTS) products in MIL/aero environments. Specific application areas include upgrading legacy flightline systems to accommodate evolving smart weapons, electronic warfare (EW) and threat detection, and the commercialization of space (NewSpace).

Test sets to systems

Products that Marvin Test Solutions offers to help meet the challenges of military/aerospace test applications include the MTS-3060A SmartCan Universal O-Level Armament Test Set. "Marvin Test Solutions developed, qualified, and deployed an innovative O-Level hand-held test set that supports both legacy and Smart weapon armament systems test on fixed, rotary, manned, and unmanned aircraft," said Stephen T. Sargeant, CEO. "The SmartCan test set combines the power of the big-box test set with the ease of use of a hand-held test set, combining the capabilities of multiple O-Level test sets into a test set that weighs less than 4 lbs."

Sargeant described the MTS-3060A as a battery-operated O-Level test set that provides active test capabilities previously unavailable at the flightline in a hand-held test set. "Designed to functionally test the MIL-STD-1760 Bus that enables Smart munitions, the MTS-3060A SmartCan is deployed today in many countries on F-16, F-15, TA-50, FA-50, Hawk, F-18, F-5, and unmanned aerial vehicles," Sargeant said, with more deployments planned for 2020.

"The MTS-3060A SmartCan provides the capability to actively test legacy and Smart weapons and supports multiple e-load channels," Sargeant said. "The SmartCan generates audio and video signals required to test armament for missiles that produce tones or video for employment."

He explained that the MTS-3060A employs munitions emulation to actively test armament for JDAM, AMRAAM, and other 1760-based weapons systems. "The MTS-3060A SmartCan records test data that is tracked by tail number and can be downloaded for trend analysis and enhanced troubleshooting. Sargeant said the SmartCan has been deployed since 2011, and states that is the only hand-held test set on the flightline to deliver full MIL-STD-1760 Bus functionality testing capabilities (communication, arming, and release), with field-upgradable software.

Sargeant continued, "Advanced cybersecurity features further differentiate the SmartCan. Data encryption, test program set (TPS) development, and a removable hard drive in the form of SD storage all contribute to the cybersecurity of this test set. Our test software, ATEasy, is the most cybersecure test executive on the flightline today and is employed by the SmartCan."

Marvin also offers the MTS-207 Rugged Field Test Set (O-/I-Level). "The MTS-207 is a state-of-the-art portable PXI platform for field testing and data-acquisition systems," Sargeant said. "Its proven architecture has been deployed worldwide on the flightline, in the back shop, and in depot as the MTS-206A Maverick Missile, the MTS-209 Common Armament, the AN/TSM-205B Hellfire System, and the MTS-235A F-35 Armament Test Sets. The MTS-207 combines the capabilities of the versatile and powerful PXI architecture in a compact, ultrarugged, flightline-qualified enclosure."

In addition, Sargeant cited the TS-321/323 GENASYS Aerospace Test System. "The GENASYS platforms are PXI-based, customizable test systems designed to address a broad range of military and aerospace missions requiring high-performance automated functional electronic test," he said. "GENASYS is available with a range of digital, analog, and video instrument options to address both LRU and SRU test as well as supporting depot and production test. The GENASYS switching subsystem supports an 'any resource to any pin,' scalable architecture. From testing avionics

to complete electronic functional test of entire satellites, GENASYS meets the requirements of a plethora of customers."

Strategic test approach

According to Nicholas Butler, chief marketing lead for aerospace, defense, and government at NI, "NI offers modular, PXI-based measurement and control systems that can be customized for each application (and re-used across applications). As a leading supplier of PXI-based chassis, controllers, and instruments, NI provides a wide spectrum of measurement types, channel counts, frequency support, and form-factors to meet the needs of almost any aerospace and defense test application."

In addition, Butler said, "TestStand software allows customers to develop customized test sequences and routines, giving them the ability to automate test systems and thus optimize test times and test cost. Veristand software allows customers to perform embedded software validation through hardware-in-the-loop applications where they can import custom models and simulation routines.

FlexLogger software allows our customers to perform configuration-based data-logging, without the need for complex programming, and SystemLink software allows customers to remotely manage systems and data across their entire enterprise."

Nancy Friedrich, industry solutions marketing for aerospace defense, Keysight Technologies, commented on Keysight's offering for EW applications. "Our solution combines UXG generators and adapters, calibration hardware and software, and application software for prescripted or dynamic threat-generation scenarios," she said.

Specific products include the N5193A UXG X-Series agile signal generator, N5194A UXG X-Series agile vector adapter, N7660C Signal Studio for Multi-Emitter Scenario Generation, Z9500A Keysight EW Threat Simulation View, and the Z2098B threat-simulation system.

"We leverage the commercial off the shelf (COTS) expertise we have from other markets such as communications/fifth-generation (5G) to deliver scalable, high-performance EW test equipment in a faster timeline," Friedrich said. "Our testing equipment provides realism and accuracy for evolving EM spectrum operations with flexible, scalable threat simulation and analysis solutions. We support the detection, identification, and location of RF emitters in the congested EM spectrum to help our customers achieve confidence in their electronic warfare innovations."

Signal-analysis solutions

"Signal-analysis solutions are vital in streamlining today's battle for the electromagnetic spectrum," according to David Summers, market development manager, Federal, Anritsu. "A real-time spectrum analyzer (RTSA), such as the Anritsu Field Master Pro MS2090A, gives military personnel new insights that were very difficult to capture previously. Traditional analyzers are limited to viewing only one segment of the spectrum at a time. With an RTSA, the entire spectrum up to a given span can be viewed continuously. This is extremely beneficial in military and aerospace environments, as it captures transient signals and tracks fast-moving transmissions."

▲ Anritsu Field Master Pro MS2090A real-time spectrum analyzer.

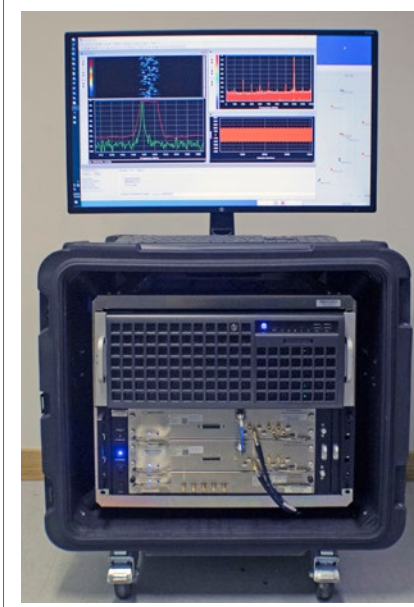
He also described Anritsu EasyTest software, which enables experienced military technicians to generate step-by-step test packages to help less experienced users learn how to test specific systems. "The inclusion of images, button pushes, and limit masks enables measurements to be done correctly each and every time,"

He described Anritsu's 4G and 5G communications network emulators as flexible platforms with modular architecture that also find use in MIL/aero design verification. "Our 5G Radio Communication Test Station MT8000A supports frequency range 1 (FR1) up to 7.125 GHz, including band n41, and frequency range 2 (FR2) mmWave bands used by 5G," he said. "When combined with the Anritsu OTA chamber, the MT8000A enables mmWave band RF measurements and beamforming tests to be made using call connections specified by 3GPP."

Capture and playback

John Regazzi, Giga-tronics CEO and acting director of marketing, said Giga-tronics' products serve three main application areas: coherent electronic attack, development of countermeasure techniques, and open-range air-crew survivability training. Giga-tronics has recently introduced a coherent multichannel capture and playback system.

COMPASS, which stands for Coherent Multichannel Playback and Acquisition Streaming System, offers the capture and playback of signals with up to 1 GHz of instantaneous bandwidth anywhere within the RF spectrum to 20 GHz while maintaining a high signal to noise ratio. Systems can be configured with up to 192 TB of solid-state drives (SSDs), allowing more than five hours of record or playback times of very wide bandwidth signals. The system features a variable sample rate that permits the playback of signals



▲ Giga-tronics COMPASS multichannel capture and playback system.

recorded on different systems and allows the efficient use of the available storage."

Gregory Anderson, area sales manager, and Darren Lingafeldt, vice president, eastern USA and Canada, both at Averna, said, "We are involved in programs that range from software defined radio to virtual headset optics and alignment."

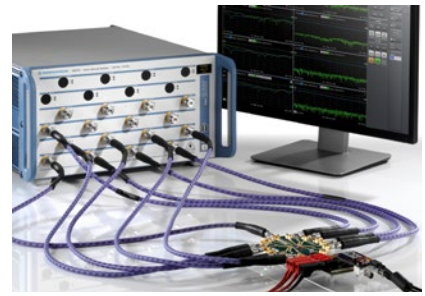
Averna offers custom solutions to serve many MIL/aero applications, according to Anderson and Lingafeldt. "From a test-products point of view, Averna has a specialty in RF test including several off-the-shelf solutions for record and playback," they said. "The RP-6100 Series is available for testing up to four channels while the RP-6500 enables wideband RF record and playback, up to 500 MHz, across frequencies from 9 kHz to 6 GHz. These are in addition to our Iridium solutions for either development or production."

◀ Averna Iridium production-test system.

Satellite communications

According to Darren McCarthy, aerospace and defense technical marketing manager at Rohde & Schwarz America, the company's solutions address development and production testing from the chip level up to final system-level verification.

"At the chip level, the R&S ZNBT40 vector network analyzer can be integrated into a turnkey tester for beamforming ICs," McCarthy said. "The R&S ZNBT is the first multiport vector network analyzer offering up to 24 integrated test ports with the ability to do high-speed simultaneous testing of multiple DUTs such as transmit and receive components."



▲ Rohde & Schwarz R&S ZNBT40 vector network analyzer.

On the benchtop, the R&S NRPM over-the-air (OTA) power-measurement solution can be used for functional integration and testing. "The high-sensitivity, fully calibrated system with low-reflection dual-polarized antenna modules offers reduced system-level measurement uncertainty," McCarthy said. "And it is scalable to customer requirements."

Rohde & Schwarz's R&S AMS OTA performance measurement software and R&S ATS1800C compact antenna test range (CATR) mmWave test chamber is well suited for system-level testing. McCarthy said, "The CATR reflector with optimized edges for uniform power distribution and high-precision surface finishing for minimal deviations in quiet zone, and the near-field to far-field measurement software provide the necessary plane-wave conversion for correlated measurements."

Analyzers and more

Tektronix serves military/aerospace test in spaces like radar and EW, RF spectrum management, communications and embedded systems, and big physics/science, according to Brad Odhner, technical marketing manager, for which the company offers real-time spectrum analyzers, analysis software, and arbitrary waveform generators.

"The new Linux API on the RSA300, RSA500, and RSA600 Series (USB RTSAs) will serve to support applications such as EW spectrum monitoring, deep-data signal analysis, RF sensor SIGINT, high-mix/low-volume manufacturing programmatic control and test, and custom SATCOM transmitter range testing," he said.

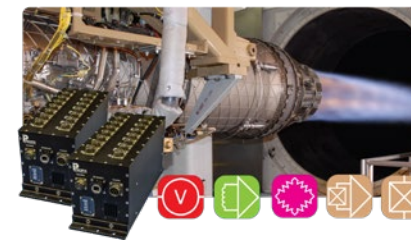
Odhner elaborated on real-time spectrum analysis, saying real-time spectrum analyzers like the RSA7100B have an IQ streaming capability.

He added that the capabilities are tied to Tektronix's SignalVu-PC and SourceXpress software offerings.

Brian Walker, senior RF design engineer at Copper Mountain Technologies said the company offers a range of vector network analyzers from 9 kHz to 110 GHz, with compatibility for use of third-party frequency extenders up to 330 GHz. "Unlike the conventional VNA, with USB instruments, the user can easily upgrade the external PC as needed to keep it up to date and secure." Walker added the company's VNAs find use in materials testing of radome materials, testing of phased array antenna systems, distance to fault measurement of avionics or shipboard RF conduits, antenna VSWR testing, cavity filter tuning, and other RF measurement applications.

Data acquisition

Pacific Instruments offers the Series 7000 16-channel ruggedized Ethernet data-acquisition system, which can handle harsh environmental conditions and wide temperature ranges, according to Patrick Rule, senior sales manager with Pacific Instruments, a VPG brand. "Each 7000 unit has 16 MIL-style inputs and an Ethernet interface for control and data output," Rule said. "IRIG time may be employed to synchronize sampling on multiple 7000s within 10 µs, or a timing pulse may be used to achieve better than 1-µs time alignment."



▲ Pacific Instruments Series 7000 16-channel ruggedized Ethernet data-acquisition system application.

Rule added that multiple 7000 systems (up to 4,096 channels) can be connected on a single Ethernet LAN, and each channel can sample at up to 200 ks/s while maintaining 1-µs synchronized sampling across all channels. "Series 7000 16-channel enclosures are designed for installation in wind tunnels, engine test stands,

and other facilities where it is desirable to locate the DAS on or near the test article, reducing installation and cable costs while improving signal quality and reliability. Temperature compensation, high gain, and 24-bit A/D provide a high-accuracy and high-resolution DAS that will perform across a wide temperature range at better than 0.05% accuracy."

Weiss Technik offers an array of test chambers including temperature, humidity, altitude, thermal shock, and dust chambers. "Many of these products include safety features such as product temperature control, burst disc, fire detection, emergency stop, interior door release, and visual and audio alarms," said product engineer Michael Stratton. He added that the Weiss Technik WEBSeason controller offers advanced control accuracy, real-time interface, multilanguage support, and connection from any device anywhere in the world."

▲ Weiss Technik drive-in test chamber.

Switching technology

Bob Stasonis, technical product specialist at Pickering Interfaces, emphasized that as FRUs get more complex, higher-density matrix switching becomes more critical, with microwave switching up to 67 GHz becoming the norm, as defense contractors look to 5G communication.[1]

"In terms of addressable markets, defense and aerospace applications tend to be high channel-count," Stasonis said. "For example, our 40-558 matrix, which offers 40% higher switching-density than our competitors, is an attractive product for those applications needing high channel-counts."

Norton W. Alderson, VP of marketing at Universal Switching Corp., commented, "Some military aircraft employ MIL-STD 1553 communication buses to control various functions and controls," he explained. "During the simulation and development portion of an airframe and its control systems, the system-engineering team will

▲ Universal Switching Corp. BS1553F automated patching unit.

want to patch together and simulate various scenarios, configurations and cable lengths." To support these teams, Norton said, "We developed our BS1553F automated patching unit to automate this patching under software or front-panel control."

Alderson said that to help control budgets, USC manufacture modular hardware where customers can begin with a smaller configuration and expand as more funding is acquired, an approach taken with the BS1553F, which can be configured from 8x8 to 64x64 in increments of eight ports in symmetrical or asymmetrical configurations."

As for applications, "We serve nearly all Major Range and Test Facility Bases (MRTFB) across the nation as well as satellite ground stations, Amy, Navy and Airforce Research Laboratories," Alderson said. "Also, we serve a large majority of defense contractors and government agencies including NOAA, NASA and the newly formed US Space Force."

Menlo Micro offers a line of MEMS switches, and the company's switch technology has been designed into a new line RF subsystem products, such as a miniaturized UHF tunable filter targeting milcom manpack and handheld radio systems, a phase shifter, and an RF switch matrix, with a roadmap for additional subsystems, according to Jonathan Leitner, senior product marketing engineer."

MIL-STD-461 and MIL-STD-464 testing

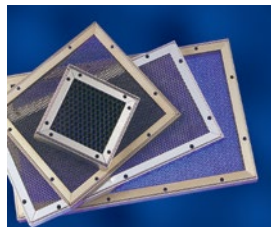
AR RF/Microwave Instrumentation focuses on topics such as EMC testing. The company is seeing more effort being focused on MIL-STD-464, which covers entire systems rather than system component testing, according to Dean Landers, applications engineer, adding that the company's products are used worldwide for MIL-STD-461 and MIL-STD-464 testing.

▲ AR RF/Microwave Instrumentation custom system. Courtesy AR RF/Microwave Instrumentation.

"As always, the biggest challenge facing radiated susceptibility testing is the 100-MHz to 200-MHz frequency range, where antennas often have negative gain," Landers said. "This can result in severe impedance mismatches which lead to low delivered power and high reflected power. Fortunately, our amplifiers can withstand the results of these heavy mismatches with no damage to the amplifier output."

Landers said, "We can also incorporate a customer's existing equipment into our system for seamless integration and operation."

Spira Manufacturing offers gaskets and filters for DoD weapon systems in simulated Faraday cages to ensure the systems operate properly in their designated environment without experiencing or adding EMI, according to George Kunkel, CEO

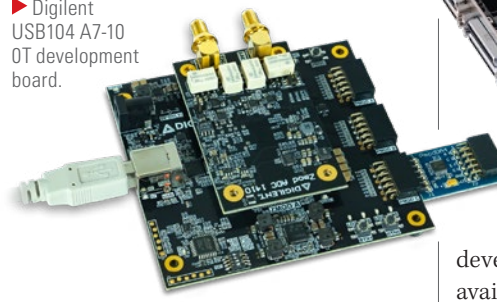


▶ Spira Manufacturing shielded air-vent honeycomb filters.

and chief engineer. To shield air-vent apertures in such systems, Spira has patented a process that can be used to fabricate a blended honeycomb panel (as opposed to basic brass or aluminum honeycomb panels) that can provide up to 40 dB of shielding above that provided by a basic aluminum honeycomb panel, as well as shielding that can exceed 80 dB at 1 GHz for a one-quarter-inch thick panel. The company also offers back- and front-mount EMI and environmental connector-seal gaskets.

Embedded ecosystem

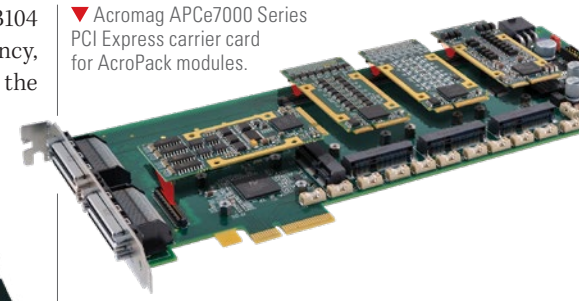
According to William Wadkins, FPGA product manager at Digilent, the company recently introduced the USB104 A7-100T to bring FPGA power, efficiency, and high-speed signal processing to the PC/104 embedded ecosystem.



▶ Digilent USB104 A7-10 0T development board.

Wadkins explained that an onboard USB controller provides interfacing and programming of the FPGA through both JTAG and UART with only a single connection. He added that an onboard QUAD-SPI flash stores the FPGA configuration between power cycles.

"Acromag offers a wide variety of AcroPack I/O modules, which provide a PCIe-based alternative to the older IndustryPack mezzanine technology," said Robert Greenfield, business development manager. "AcroPacks are available for A/D, D/A, digital I/O, counter/timer, CAN bus, serial communication, avionics interfaces, and FPGA computing functions. Carrier cards host any mix of up to four I/O modules on PCIe, 3U/6U VPX, CompactPCI-Serial, and mini-ITX form factors."



▼ Acromag APCe7000 Series PCI Express carrier card for AcroPack modules.

Greenfield continued, "AcroPack I/O modules are a hybrid between the popular but disappearing IndustryPack modules and mini-PCIe cards that often

lack the durability required for mil/aero applications."

Power sources

"Pacific Power Source recently launched a complete new line of linear programmable power sources with a color touch screen user interface aimed at Mil/Aero ATE power test applications," according to Herman vanEijkelenburg, director of marketing at PPST Solutions, the corporate affiliate distribution channel for Pacific Power Source.

"Pacific Power Source's new LMX Series linear AC power sources meet the need for low noise, low distortion, high-quality AC power not available from general-purpose switch-mode AC power sources," vanEijkelenburg said. "With both single- and three-phase models covering a range of power levels from 500 VA to 30 kVA, these linear AC sources offer high-performance programmable power with modern control interfaces like LXI-compliant LAN and USB. Pacific Power also offers a broad library of power test-compliance software

▲ Pacific Power Source LMX Series linear-technology-based AC power source.

suites for airplane equipment, including MIL-STD 704 and RTCA/DO160, as well as manufacturer-specific test standards for Airbus and Boeing."

Kikusui offers AC power supplies (PCR-WE Series) that through parallel operation can support outputs to 144 kVA; the frequency can extend to 5 kHz, the spokesperson said, adding that it can also serve as a DC supply that can be used in power-supply fluctuation test. "The high-speed amplifier bipolar power supply (PBZ Series) can simulate a load connected to the DC line of the battery and DC/DC converter using the actual waveform data acquired in the field for evaluation and testing." A built-in waveform generator can be used for noise superposition and low-voltage power supply voltage fluctuation test.

Chassis and connectors

Hartmann Electronic focuses on PXI/PXIe, which Frank Godulla, CEO and director of sales, described as the leading bus technology for modular ATE systems. "Our focus is on extending our line of PXIe chassis for both standalone setups as well as for more complex test applications," he said. "The current 6- and 8-slot hybrid Hartmann Electronic PXIe/PXI bus backplanes were designed in a modular way."

In related news, Justin Moll, vice president of sales and marketing, Pixus Technologies, said the company is offering a new product to address the trend of aerospace apps starting to use SpaceVPX

(VITA 78, etc.). The new product is an OpenVPX chassis platform that supports both 160-mm deep (standard OpenVPX) and 220-mm deep (SpaceVPX) boards. The open-frame chassis features up to four slots at 1.0-in. pitch of each board depth type. The modular enclosure allows various board pitches to be used at 0.2-in. increments. Card guides support both air-cooled boards and conduction-cooled boards, with wider 220-mm-deep card guides to support extra-thick SpaceVPX conduction-cooled boards per VITA 78.

Trends and challenges

"The trend we see is that maintainers are seeking easy to use, sustain, and deploy test sets that overcome the obsolescence and multiple large box test sets found on the flightline today," said Sargeant of Marvin Test Solutions.

According to Sargeant, maintainers face using multiple large-box test sets that take several airmen to carry to the flightline, and consume large amounts of time to set up, tear down, and run tests on the flightline. "These large, slow test sets compound the problem of the reduced number and lower experience levels of maintainers found in squadrons today. All levels of maintainers are faced with an ever-growing number of cyber threats, therefore, they are searching for cybersecure test sets to combat the threat."

Butler at NI cited many trends affecting NI's aerospace and defense customers. "Through digital transformation initiatives, these customers are looking to modernize both their products and their processes. This trend is the result of a convergence of digital technologies, and promises to revolutionize the way companies design, manufacture, and service their products."

McCarthy at Rohde & Schwarz cited the commercialization of space, or NewSpace, as an interesting trend. "It is clear that the military and aerospace industries are attempting to leverage commercial technologies in space," he said. "From a standpoint of RF and microwave communications testing, this also involves the desire to utilize commercial communications standards in NewSpace, for secure and globally-available networks."

McCarthy added that commercial communications standards being developed in parallel include the 3GPP work item on non-terrestrial networks (NTN). "NTNs can provide a tactical battlefield or global coverage of secure networks, and they have three areas of concerted development in the defense industry: low-Earth orbit (LEO) satellite systems, high-altitude platform stations (HAPS), and unmanned aircraft systems (UAS)," he said. "Of these three investments, some of the most promising and popular innovations are the investments in the LEO constellation networks."

Walker at Copper Mountain Technologies commented on security from the perspective of a vector network analyzer manufacturer, calling USB VNAs a better fit than traditional instruments. "Taking traditional network analyzers in and out of secure environments is a lot of work, requiring removable hard drives, data-purging procedures, and oversight over those data-purging procedures. With USB VNAs the computer that stores and processes the data is separate from the measurement module, so, as long as the computer stays in the secure area, all data concerns are eliminated, and the data measurement module can easily move between laboratories and sites. Our measurement module has only volatile memory, so no data is retained, and the separate PC can be made secure following standard security protocols."

Anritsu has noticed two main trends, according to Summers. First, "Deployed systems are continuing to be more technical, along with the tools used to maintain them and technologies, yet are easy to operate," he said.

Summers cited challenges related to signals intelligence (SIGINT) and electronic warfare (EW), which require precise test and measurement equipment, such as spectrum analyzers, to operate according to specification in demanding environments.

Rule at Pacific Instruments identified trends toward large-scale systems and structure testing requiring an integrated data-acquisition system capable of supporting multiple types of sensors, wide range of sample rates, filtering schemes, modularity and expandability. "For smaller scale tests, many military and aerospace facilities are evaluating and moving toward a distributed data-acquisition system architecture. The ability to utilize a network of small data-acquisition systems located as desired and linked together as one large system is advantageous in many applications," he said.

According to Stasonis at Pickering Interfaces, "The advances in AI and machine learning will likely mean more HILS applications to test for all possible circumstances, whether it is hardware, firmware, or software testing to prove that the 'lessons learned' are correct. We are also seeing a drive for smaller test systems to bring better support to the battlefront."

▲ Pickering Interfaces Model 40-558 matrix.

Stasonis emphasized that the product life/availability of test gear should be as long as possible. "For defense applications that are reaching end-of-life—for example, VXI instrumentation—we offer migration paths from VXI switching to PXI. In order to keep our product families supportable in the long haul, we have gone through projects where we design out obsolescence in our products—ensuring that newer designs are form/fit/function the same compared to older models."

Regazzi at Giga-tronics commented on trends from both a business and technology perspective: The demand has finally arrived for test equipment to process signals with instantaneous bandwidths in the GHz range.

Averna over the past year has identified two trends that have stood out in MIL/aero test. "The first is a result of the many acquisitions that have transpired within the industry. Now we are seeing companies investing in streamlining the

inherited source code and multiple platforms." said Anderson and Lingafeldt. "We have also seen increased connectivity testing for Iridium network-based aircraft communication modules. With the contribution Iridium Communications has made towards reliable communications coverage anywhere in the world, the integration of their modems and technology into mil-aero solutions continues to grow."

According to Wadkins at Digilent, "The earlier standards for embedded computing often used in MIL/aero applications, such as PC/104 and VME, required CPU cards, single-board computers (SBCs), and I/O to be specifically compatible with the connectors and mechanical features specified by those standards. The demand for serial buses, particularly USB for its already widespread adoption, has increased within the embedded PC world."

"The US Army has awarded in excess of $3B in contracts for a new generation of manpack and handheld radios with enhanced performance over the existing first-generation software-defined radio technology," said Leitner at Menlo Micro. "These 'second-generation' radios are required to have improved digital modulations, waveforms, and data rates, while supporting existing milcom systems like SINCGARS. The largest share of these new contracts will be for field handheld radios."

According to Greenfield at Acromag, "Many customers continue to migrate from VME-based systems as boards go end-of-life. The alternative is usually a rugged server with PCIe expansion cards, or a rugged small-form-factor embedded computer with mini-PCIe modules."

A Kikusui spokesman said, "There is also a demand for variable frequency, and there is a demand for an AC power supply that can output frequencies of 1 kHz or higher," the spokesperson said, with applications including the evaluation and test of VFAC (variable-frequency AC) generation systems. Consequently, variable-frequency outputs are required in addition to 400-Hz outputs. Also required is bidirectional, regenerative operation for battery discharge test.

vanEijkelenburg at Pacific Power Source commented that trends evolve slowly in aerospace applications due to regulatory and FAA requirements requiring extensive certification cycles. "However, there is a growing trend towards replacing hydraulic systems with electrical systems in an effort to reduce lifetime maintenance costs," he said. EE

The complete version of the Mil/Aero Special Report is available on the EE-Evaluation Engineering *website at evaluationengineering.com/21148800.*

REFERENCE

1. Nelson, Rick, "From the Simulation Environment to the Flightline," *EE-Evaluation Engineering*, February 2020, p. 10.