

ELECTRONIC WARFARE INDUSTRY ROUNDTABLE

TISR reached out to several industry thought leaders and asked the question:
How have your technologies aided the tactical communications of the warfighter?

dB Control

Warfighters must stay in constant communication with each other, commanders and the Global Information Grid (the U.S. Department of Defense's worldwide network-centric information system). And when potential enemy radar is detected, threat emitters must be able to simulate these electronic signatures and alert warfighters. However, this simulation (and subsequently, tactical communication) may be negatively impacted in complex environments (i.e., weather, terrain, distance, etc.).

Threat emitters, used to simulate electronic signatures of possible enemy radar, have been historically subject to degradation in adverse conditions. Fortunately, hub-mounted traveling wave tube amplifiers (TWTAs) and microwave power modules (MPMs) enable threat emitters to simulate multiple threats over a wide band even under adverse conditions. When integrated into a threat system, these threat emitters can transmit with less waveguide loss, thereby creating greater overall RF power. With much more output power than solid-state products, a rugged design and the ability to withstand harsh environmental tests, dB Control TWTAs and MPMs can operate in extremely adverse conditions. And with an operating life of more than 10 years, TWTAs provide a continuous source of reliable power for the warfighter. In fact, DoD's Unmanned Systems Integrated Roadmap for fiscal years 2013-2038 emphasizes the need for UAVs "to operate in more complex environments involving weather, terrain, distance and airspace."

Another element of tactical communications is providing the warfighter—specifically unmanned aerial vehicle operators—with high-resolution visual scenes and images for payload operations. One of the most successful examples is the MQ-9 Reaper UAV. Operated remotely from thousands of miles away, this UAV can fly for more than 30 hours at altitudes of more than 30,000 feet. The remote pilot's 'eyes' come in the form of a high-resolution, Lynx multi-mode radar that operates in synthetic aperture radar and ground moving target indicator modes. On this particular platform, image accuracy is directly connected to the performance, reliability and operational capacity of dB Control's high-power TWTAs.

The military also has stringent specifications for product size and weight. To meet these needs, dB Control developed proprietary transformer fabrication, encapsulation and high-voltage potting techniques that enable components to be compactly held within the final product. In particular, MPMs combine TWT and solid-state technology to create a compact, high-power amplifier that meets tactical needs for bandwidth, power output and efficiency.

Robert Smith, Ph.D.
Vice President of C4ISR
Lockheed Martin

When Lockheed Martin looks at developing technologies for the warfighter, we look at the strategic, operational and tactical mission. While our focus is to provide communications for the warfighter at the tactical edge or squad level, we continually innovate to provide solutions for all levels of command. We constantly strive to provide greater capability and functionality from the COCOM operations center down to the remote fire team manning an observation post.

Our mission is to transform and augment end-users' communications capabilities to extend the network to lower echelons via modular, scalable and interoperable nodes, enabling mission command at all levels. We have focused on technology thrusts for tactical communications that go beyond voice by providing mission command applications to the edge. Warfighters today have a wealth of combat enablers supporting them. They need to get the right information at the right time—and it all begins with the network. While our current work is building and enhancing that network, we also look at ways we can enable mission command at the edge. Our Whetstone system or tactical switchblade server provides vast improvements in storage, processing, exploitation and dissemination—all this with monumental improvement in economy of size, weight and power.

Along with developing new capabilities, we can't build everything. Our dedication to integrate the best technologies available is critical for our warfighters to dominate against any enemy in any situation. Through this focus our systems engineering rigor and systems integration discipline are the best in breed, because warfighters need seamless systems. Our focus in this area remains on communications to the edge in satellite, troposcatter and terrestrial technology. Along with enabling various means of communications, Lockheed understands our forces operate with coalition and host nation security forces constantly. Given the need for interoperable communications, we also have tools to provide seamless multiple-security-level systems to enable interoperable tactical communications in order to support security and policy needs.

Overall Lockheed Martin is committed to continually improving our tactical communications systems, products and integration. The warfighter deserves the best technology available for a host of contingencies—and Lockheed Martin is the provider who will be a partner with our armed forces to continually innovate and provide them with tools they want and need.

Raytheon has aided war-fighter tactical communications in numerous ways, starting in World War I and evolving into present-day wide bandwidth networked communications in Afghanistan. The emergence of a fundamental understanding of the dramatic value of a netted enterprise, underpinned by the application of Metcalf's and Reed's laws, drove Raytheon to explore the enabling connectivity, processing, precision, navigation and timing technologies. These missions are increasingly multi-node, distributed, fractionated, real-time and subject to the rigors of contested airspace. Electronic warfare resource management and ISR product processing, exploitation and distribution lead multiple emergent networked mission applications.

Raytheon fielded an operational tactical data network with its Enhanced Position Location Reporting System (EPLRS) network element, achieving 3Mb throughputs of ISR video and sensor data as well as real-time situational awareness. The Situational Awareness Data Link extended EPLRS to the F-16 and A-10. Follow-on DARPA funding developed the Networked Mobile Ad Hoc Networks (MANET) Waveform, currently deployed in Southwest Asia, providing a 10Mb throughput network (20Mb raw data rate) with up to 128 nodes. This MANET network supports multiple simultaneous ISR video data streams in a compact form factor for ground and/or airborne applications. Raytheon also provides wideband advanced MANET in the Cooperative Engagement Capability data network, distributing high bandwidth radar sensor data in real time across multiple maritime and airborne platforms.

Next-generation cryptology equipment added cyber protection for the tactical user with the VINSON Advanced Narrowband Digital Voice Terminal Crypto Modernization program. KG-340 family cryptology devices, with up to 100Gb data throughput for high bandwidth applications, is also being delivered.

Network warfare operations rely on the ability to provide multiple data link streams to disparate platforms in operational environments. Multi-beam phased array antennas that support data link frequencies are required. Getting ISR data out of theater in a stressful RF environment remains a warfighter challenge. Advanced extremely high frequency terminals provide the highest assurance protected communications available to users—the Army's Secure Mobile Anti-Jam Reliable Tactical Terminal, fielded with tactical forces, assures connectivity in the harshest conditions. Next-generation terminals are in technology development with the Air Force, where Raytheon is developing a high bandwidth, protected, anti-jam terminal that will operate over current satellites, available to a wide community of ground and airborne users. Future warfighter effectiveness is based on enabling the net, and Raytheon is committed to developing and integrating the key technologies.

Greg Powers
Market Development Manager, Global Aerospace,
Defense & Marine
TE Connectivity

A key issue in man-portable systems is weight. As individual warfighters are equipped with evermore sophisticated electronics, the systems must be rugged, easy to use, and compatible with the needs for mobility under battlefield conditions.

At TE Connectivity (TE), we have been advancing the practicality of composite enclosures offering the strength of metal at weight savings of up to 50 percent. We offer a range of composite formulations to allow designers to balance tradeoffs in weight, strength, electromagnetic interference shielding and other needs. Beyond weight and space savings, composites can be easily molded into shapes that would be difficult or cost-prohibitive with aluminum.

Equally important is the ability to embed circuit traces, connectors, antennas and other features into the composite. We are leveraging our experience as a leading provider of embedded antennas for consumer mobile phones to create more rugged enclosures and more sophisticated antennas. The ability to integrate multiple antennas—including 3-D structures with controlled beam pattern and broadband performance—not only helps meet the communications requirements of warfighters, but also allows rugged damage-resistant designs with low observable profiles.

Beyond the warfighter, we are meeting next-generation connectivity needs of tactical communications with connectors that combine smaller size with high data rates. We've recently introduced three families of input/output connectors that support 10Gb/s Ethernet. Each family offers different advantages in terms of size and weight, field repairability, cost and other features.

Space and weight savings can occur by creating a smaller connector or by packing more contacts into an existing connector. Our CeeLok FAS-T nano connector, with its nanominiature 0.3-inch diameter, is the smallest 10Gb/s circular connector available. It features an innovative contact pattern that enhances noise cancellation and reduces crosstalk. If high density input/output is desired, our Wildcat 38999 connectors offer nearly double the contact density of standard 38999s in the familiar MIL-DTL-38999 form factor.

As tactical communications systems continue to evolve, end-to-end connectivity will play a more important role. Preventing performance bottlenecks and maintaining signal integrity require increased attention in making sure all parts of the system offer the same level of performance. System performance, after all, is largely constrained by the proverbial weakest link. At TE, we know that every connection counts and we focus our energies to ensure our products and systems make our customers successful. ♦