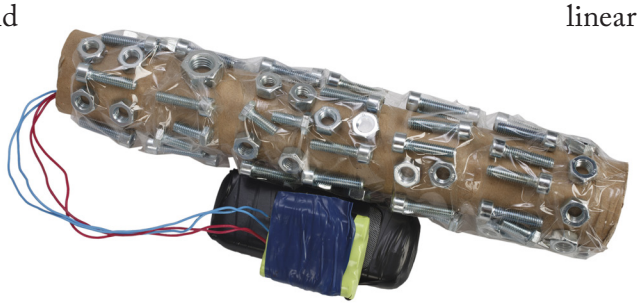
MAKING WAVES

With SBIR support, a collaborative research effort leads to IED detection and disablement

Over one-half of all American wartime fatalities in Afghanistan and Iraq were caused by improvised explosive devices (IEDs). Portable, easily made, and easily disguised, IEDs presented a unique and nearly intractable problem for American Warfighters and allies. How do you avoid or disable a threat that can be hidden almost anywhere?

Part of the solution was to be found in the triggering devices. A high percentage of these IEDs were detonated using electromagnetic (radio) signals, such as from cell phones. What if it was possible to transmit a complex electromagnetic signal that would interact with these electronic devices in a non-linear manner, producing a unique and detectable signal and even



Improvised explosive devices (IEDs) often use radio signals to trigger detonation.

disabling their operations? A similar (albeit much simpler) approach had been used by the Allies during World War II, driving down streets to find spy radios by broadcasting a strong radio signal and detecting much weaker resulting signals from the spy radios.

And this was the type of approach to IED disruption envisioned by James Harvey, Research Program Manager with the Army Research Office (ARO), and later implemented as an operating system by Vadum, Inc., a small technology firm in Raleigh, NC, using funding from the Army's Small Business Innovation Research (SBIR) program.

Vadum CEO Aaron Walker had been a graduate student at North Carolina State University, working under Michael Steer, Professor of Electrical and Computer Engineering, when Professor Steer received a grant from ARO under the Multidisciplinary University Research Initiatives (MURI) program to explore Harvey's conceptual approach in exploiting nonlinear effects. As their results showed more promise, Dev Palmer, ARO's Electromagnetics Program Manager, developed a SBIR topic that would eventually result in a working prototype. By this time, Vadum stood ready and prepared to answer the SBIR call.

Over the next few years, Vadum's SBIR-funded research proceeded to make a series of dramatic advancements in nonlinear radio wave detection and disruption. "The concept we were after," said Walker, "was fairly straightforward."

Straightforward, but also paradigm changing. Getting a return signal that is distinguishable from the one being put out, at relatively low power, was a game changer. It opened the technology up to other applications—like detecting non-transmitting radios at a distance and on the battlefield. These new ways of interpreting signals led to even more sophisticated work.

SBIR Phase II funds, combined with other sources of funding, allowed Vadum to explore detecting and disabling improvised explosive devices (IEDs) at long range. Their breakthrough research led Steer and Palmer to a prestigious Army Service Award by the Commanding General of the Army Research Development and Engineering Command. Steer was also elected to the Association of Old Crows Electronic Warfare Technology Hall of Fame.

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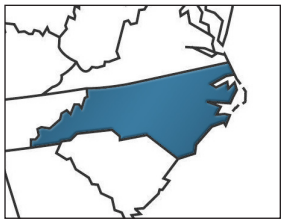
Twenty years after the initial idea, the SBIR funding continues to have an effect. The company still researches sensors and electronic devices in the field—especially how to detect, locate, and interfere with the devices.

Referring to the original SBIR work, Walker said, "We got involved in a lot of electronic attack and jamming work which helped us understand how electronic disruption was effective against certain communication devices. That led us to develop an ability to estimate how effective jamming is from different field sensor measurements."

Working with prime contractors, Vadum now provides the electronic warfare battle damage assessment (EWBDA) plug-in that assesses whether jamming is effective, in real-time, based on sensor reports. The outcome is an Electronic Warfare Planning and Management Tool (EWPMT) that is a military program of record. Related Vadum software was also developed under the Defense Advanced Research Projects Agency (DARPA) and Navy Adaptive Radar Countermeasures (ARC) programs to counter advanced air defense radars.



Modernization Priorities: Fully Networked Command, Control, and Communications (FNC3), Microelectronics
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National Defense Strategy Pillar: Force Readiness and Lethality