

# DEVICE DISRUPTORS

American and allied Warfighters are protected from IEDs  
with help from the SBIR program



Beginning in 2003, when the United States and its allies engaged in the Iraq and Afghanistan Wars, Warfighters faced a deadly and effective category of weaponry: improvised explosive devices (IEDs). Cheap, easy to make, and easily camouflaged, IEDs wounded and killed allied and American Warfighters at an appalling and unexpected rate.

Finding and disarming these hidden weapons became an immediate priority for the Department of Defense. They turned to the private sector, through the Small Business Innovation Research (SBIR) program, for help.

FIRST RF, at that time a small, six-person company

based in Boulder, Colorado, proposed a solution—a new antenna technology that, when combined with new electronic systems, would result in a durable device that could stand up to the rigors of the battlefield even while finding IEDs and preventing detonation.

Farzin Lalezari, co-founder of FIRST RF, said that, when he first began the project, he didn't think it was possible to build what the US Army wanted: a high-power antenna that operated across an extremely wide bandwidth, from 20 megahertz to 2000 megahertz. It would be a device that could pick up radio signals ranging from key fobs to the most sophisticated cellular technology.

Lalezari also didn't know what the device was for until he met with an "extremely influential visitor" from the Department of Defense, who explained the technology was needed to detect IEDs, which were proving so effective in Iraq and Afghanistan. The IEDs are essentially radio-controlled mines that can be detonated with electronic signals of various types.

"We would hear in the news of soldiers being killed and wounded (by IEDs) every day," Lalezari said. Once he knew what the device was for, he had an extra incentive to work hard on a solution. "Our enemies had learned very quickly that they had discovered an effective weapon against us and our allies."

Lalezari and his colleagues experimented with different ways to combine several types of antennas into a resilient yet portable housing, something that could be attached to a Humvee or other armored vehicles.

"How many times I failed," Lalezari said. "Eventually, I did it. I had an a-ha moment."

The initial work was funded by a Phase I SBIR award, which allowed the company to produce an effective prototype. A Phase II SBIR preceded orders for 500 of the devices, which posed other challenges for the small company.

Attachment hardware was an additional challenge, as was the wiring harness to connect the antenna to electronics inside the vehicle. Even applying the desert sand-colored paint posed problems. At 50 inches tall, plus a mounting base with a spring, the antenna is visible on a vehicle. It wouldn't be long, FIRST RF believed, before insurgents would figure out that the device was meant to disarm their explosives. That



means it would be a target, so it had to be able to withstand gunfire and disabling traps such as wires strung across roadways.

The technology also had to distinguish between signals aimed at IEDs from the "noise" of cellphone conversations, radio chatter, and other electronic signals. While the details are classified, the device works.

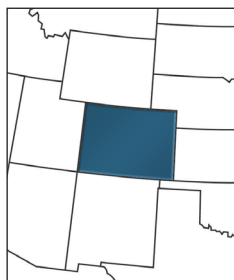
"It detects it, it disrupts it, it deceives it, and it eventually destroys it," Lalezari said. "It's very effective against all threats."

**"I felt very fortunate to help our country and our soldiers at a time when it was needed," Lalezari said. "We recognized from day one that we were dealing with people's lives."**

Early in the process, Lalezari said he made a "unilateral decision" to overbuild the antenna, to give it the ability to pick up even more signals and from a broader frequency range than the military had asked for. That proved to be a good decision, he said, because, within six months, as insurgent tactics changed, the extra capacity had "become a requirement, not just a nice thing to have."

"Between 2004 and 2008, the average number of US soldiers wounded by IEDs (In Iraq) was roughly 336 a month," according to Anthony H. Cordesman, writing for The Center for Strategic and International Studies. By 2010, that number had dropped to an average of about 25 a month. While a variety of factors contributed to that reduction, better detection and disruption was an especially strong factor. FIRST RF ultimately manufactured approximately 200,000 copies of the antenna, and the SBIR program was a key element of the success of the program and ultimate mission of the system.

"I felt very fortunate to help our country and our soldiers at a time when it was needed," Lalezari said. "We recognized from day one that we were dealing with people's lives." 🌟



Modernization Priorities: Fully Networked Command, Control, and Communications (FNC3)

SBIR Contract: W15P7T-05-C-R001 • Agency: Army • Topic: A03-080 Small Multi-decade Communications and Electronic Warfare (EW) Antenna

National Defense Strategy Pillar: Force Readiness & Lethality

The content in this article does not constitute or imply endorsement by the Department of Defense or the Military Service(s) of the provider or producer of the technology, product, process, or services mentioned.