

SBIR/STTR TRANSITION PROGRAM

SPOTLIGHT

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FIRST RF: 20 Years of Providing Military Solutions through SBIR

By Julie Scuderi

FIRST RF Corporation (FIRST RF) has enjoyed decades of success in both the government and commercial sectors thanks to its state-of-the-art antennas and radio frequency (RF) systems. FIRST RF is on a mission, one that involves the constant improvement of its existing products and the continual drive to develop new innovations that meet the military's most pressing needs. That's why the Colorado-based company continues to leverage the Small Business Innovation Research (SBIR) program to fund these solutions that more often than not transition to Phase III successes and find their places on major programs of record.

"We're an engineering firm through and through, so we are very innovative, but also reactive," explains Tim Meenach, market segment lead for Communication Products at FIRST RF. "We look at a problem, devise solutions, and then execute them in short time frames. We've been very successful with novel solutions that we propose. That gets us in the door to phase I and then we work very hard to vet our theories and concepts in order to get to Phase II."

FIRST RF has a long history of providing antenna solutions to the Department of Defense. In fact, the largest antenna production program in the agency's history



U.S. Navy Photo

An MQ-4C on the runway at Marine Corps Air Station Iwakuni, Japan. The MQ-4C Triton is the target transition platform for FIRST RF's DARWIN technology, which will enable airborne line of sight communication architecture for resilient communications.

began as an SBIR Phase I in the early 2000s with FIRST RF. Since then, over 250,000 antennas have been produced that support ultra-wideband electronic warfare with hundreds of millions of dollars in revenue.

The company first made headlines as a leading provider of phased array technology. A phased array is a type of antenna comprised of various radiating elements that each contain a phase shifter. Beams are formed by shifting the phase of the signal emitted from each radiating element to provide constructive/destructive interference that steers the beams in the desired direction. Even today, FIRST RF's antennas boast this same phased array technology.

FIRST RF also developed and delivered tactical vehicular antenna systems to the

U.S. Army for use within the global war on terror. The multi-decade antenna technology became the first antenna designated as the Army “common antenna.” FIRST RF worked with the U.S. Marine Corps for years through Navy SBIR, evolving its phased array technology through multiple Phase III contracts for use on Navy flight systems that broadcast live video down to troops or to other ships and crew. Every one of these antennas were designed and built in Boulder, Colorado, home to FIRST RF’s 50,000 square foot facility.

Once a project is in Phase II of the Navy SBIR program, FIRST RF participates in the Navy SBIR/ STTR Transition Program (Navy STP) and uses the platform to showcase its solution to a larger audience. One of its most recent Navy STP

projects came through the Naval Air Systems Command (NAVAIR): Topic N181-007, Robust Communications Relay with DARWIN for Manned-Unmanned Teaming in a Spectrum Denied Environment.

DARWIN, short for Distributed Airborne Reliable Wide-Area Interoperable Network, is a FIRST RF technology comprised of an active electronically scanned array (AESA) antenna with four beams per quadrant.

These beams operate as airborne nodes or ground nodes to allow the relay for networked communication links between two air nodes. DARWIN, which is portable and lightweight, has enhanced bandwidth in the Ku-band CDL spectrum to provide even higher data rates and easier assignment of multiple links in an ad hoc networking environment.

“The benefit for us with the Navy STP is the ability to brief our technology and align with other potential customers,” says Meenach. “SBIR as a whole is great. It gives us—and really any small business—the opportunity to propose an idea and get it in front of decision makers and people that can fund it. Conversely, if we were to compete head-to-head with larger companies

that have more capabilities and larger teams and investments, we just couldn’t do it without SBIR.”

FIRST RF demoed DARWIN at the Mobile Unmanned/Manned Distributed Lethality Aerial Network (MUDLAN) Joint Capability Technology Demonstration (JCTD), a three-year project with a goal to provide end-to-end network architectures for connectivity between multiple airborne,



U.S. Navy Photo

FIRST RF will integrate its Navy SBIR-funded scalable active electronically scanned array (AESA) antenna onto the MQ-8C Fire Scout UAV. The hardware is modular to allow smaller form factors for UAVs using fewer subarrays and larger form factors for manned aircraft with many subarrays.

surface, and ground platforms. FIRST RF used DARWIN to successfully form multiple communication links simultaneously and complete handoffs from one physical piece of hardware to the next without any interruption in activity, or as Meenach puts it, “a continuity of connectivity and data.”

FIRST RF is currently working to improve its AESA antenna technology, increase its capabilities, reduce its power consumption and get it one step closer to full manufacturing. It is envisioned that MQ-4, MQ-25, MQ-8, E-2D, BACN, and USAF bombers and tankers, and SOCOM Army UAVs will all utilize this architecture to enable airborne line of sight (LOS) communication architecture for resilient communications. The company is also working toward antenna products that are interchangeable, that can easily integrate with other systems and have a digital interface.

DARWIN was one of four FIRST RF technologies that made its way through the Navy STP in 2021-22. Topic NI81-064, Scalable Directional Antenna for Unmanned Aerial Vehicles (UAVs) also debuted alongside DARWIN. As part of this Phase II SBIR, FIRST RF developed modular versions of its AESA antennas providing high data rate beams. The modular design can be scaled from smaller unmanned to larger manned aircraft and has flight heritage to reduce transition risk. The MQ-8C Fire Scout is the target transition platform.

This project meets the Navy’s desire to develop alternative routing of data through

low-cost airborne UAV nodes to enable high data bandwidth, robust connectivity, and data routing flexibility between platforms in the surface fleet. A critical component necessary for this capability is a directional antenna architecture that has the flexibility to scale in size, weight, and power (SWaP), and is suitable for airborne applications.

Achieving this solution provides several benefits to the warfighter. It enables a greater proliferation of geographically diverse network nodes enabling data routing around electromagnetic interference (EMI) sources. It can also provide a relay functionality that supports sustained network connectivity between geographically diverse nodes. In both instances, the system performance can be improved while avoiding deployment of high-cost tactical assets or deploying manned systems for these functions.

While 2021 was certainly a busy year for FIRST RF in terms of SBIR and Navy STP participation, the company has no plans for slowing down anytime soon. Whether it’s evolving the current product suite or coming up with brand new ways to meet warfighter needs, FIRST RF is cementing its spot as a small business the U.S. military can continually turn to for solutions. For more information, visit the company website at www.firstrf.com.

