## Topic: N181-007

## FIRST RF CORPORATION

Robust Communications Relay with Distributed Airborne Reliable Wide-Area Interoperable Network (DARWIN) for Manned-Unmanned Teaming in a Spectrum Denied Environment

Current Common Data Link (CDL) and Tactical CDL (TCDL)communication links from aircraft use high-gain mechanically pointed directional antennas and/or low-gain omnidirectional antennas for air-to-ground links. This new Active Electronically Scanned Array (AESA) antenna provides multiple high-gain directional beams to provide ad hoc networking for air-to-ground and air-to-air nodes. This AESA antenna is designed to take advantage of the additional spectrum in Ku-band to provide more links with greater data rates than for the original smaller spectrum in this frequency band. Electronic steering of the antenna maintains multiple high data rate links from dynamic airborne platforms. Many hours of flight testing on the earlier reduced spectrum version of this AESA design provides a low risk path to aircraft integration for this new wideband, full-spectrum AESA antenna.

## Technology Category Alignment:

Command, Control, Communications, Computers, & Intelligence (C4I)

**Contact:**
Dean Paschen
dpaschen@firstrf.com
(303) 449-5211145
https://firstrf.com/
**SYSCOM:** NAVAIR
**Contract:** N68335-20-C-0130

Corporate Brochure: https://navystp.com/vtm/open_file?type=brochure&id=N68335-20-C-0130

Tech Talk: https://www.youtube.com/watch?v=3UXf1svr0sI

# Department of the Navy SBIR/STTR Transition Program

DISTRIBUTION STATEMENT A. Approved for public release. Distribution is unlimited.
NAVAIR 2020-859

Topic # N181-007

Robust Communications Relay with Distributed Airborne Reliable Wide-Area Interoperable Network (DARWIN) for Manned-Unmanned Teaming in a Spectrum Denied Environment

## WHO

**SYSCOM:** NAVAIR

**Sponsoring Program:** PE 0603648D8Z Joint Capability Technology Demonstration (JCTD); PMA 262 Persistent Maritime Unmanned Aircraft Systems

**Transition Target:** MQ-4C Triton, MQ-25A Stingray, MQ-8 Firescout, E-2D Advanced Hawkeye (AHE)

**TPOC:**
(619)553-8713

**Other transition opportunities:** Battlefield Airborne Communications Node, or BACN, USAF bombers and tankers, and SOCOM Army UAVs

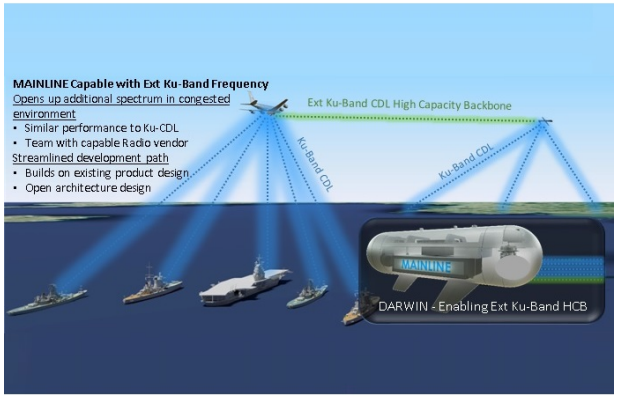



Image Courtesy of FIRST RF Corporation

## WHAT

**Operational Need and Improvement:** High data rate communication links are needed to share multi-asset Intelligence, Surveillance, and Reconnaissance (ISR) data in a constantly maneuvering environment. The communications relay system needs to include a resilient Distributed Airborne Reliable Wide-Area Interoperable Network (DARWIN) and a high-capacity back haul link using simultaneous co-bore sighted Ku-band antennas with Common Data Link (CDL) waveforms.

**Specifications Required:** The DARWIN network device will need to support up to 4 multi-independent level security (MILS) enclaves and also include inputs for MIL-STD 1553, LINK 16, and IP-based protocol. A highly directional back haul link will be required to support up to 100Mbps at Ku-band, simultaneously (while maneuvering) assuming 35,000ft Mean Sea Level (MSL) for 2 aircraft in link. Other lower-altitude combinations may assume lower data transfer rates when taking into account light and heavy rain regions and cloud attenuation.

**Technology Developed:** FIRST RF has developed an Active Electronically Scanned Array (AESA) antenna with 4 beams per quadrant. These beams operate as airborne nodes or ground nodes to allow the relay for networked communication links between two air nodes. This AESA 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.

**Warfighter Value:** This architecture will allow for aerial Manned-Unmanned Teaming (MUM-T) aircraft nodes, communications relay between ship-to-ship, ship-to-aircraft, aircraft-to-aircraft, and aircraft-to-ground entry points (GEPs). 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 LOS communication architecture for resilient communications.

## WHEN

**Contract Number:** N68335-20-C-0130 **Ending on:** December 17, 2021

| Milestone | Risk Level | Measure of Success | Ending TRL | Date |
|---|---|---|---|---|
| Phase I | N/A | Component measurements | 2 | November 2018 |
| Phase I Option | N/A | Component measurements | 2 | September 2019 |
| Phase II Baseline Program | N/A | | | December 2021 |

## HOW

**Projected Business Model:** FIRST RF is a product oriented company developing advanced technologies for antennas and Radio Frequency (RF) systems including communications, radar, phased arrays, Point Navigation and Timing (PNT), RF compatibility, low observable antennas, Electronic Warfare (EW), and Direction Finding (DF) systems. FIRST RF will produce antennas and integrate them onto a variety of aircraft types and sizes. Radio integration will be through a prime or directly with the government.

**Company Objectives:** FIRST RF Corporation is a developer and manufacturer of multiple-beam Active Electronically Scanned Array (AESA) antennas. The company objective on this project is to produce, test, and deliver multiple beam AESA antennas for use on aircraft to primes and government customers.

**Potential Commercial Applications:** The DARWIN architecture will provide benefit for commercial W-band wireless communications for efforts involving low-cost, long-duration air balloon communication relay nodes.

**Contact:** Dean Paschen, Director of Advanced Programs
dpaschen@firstrf.com 303-449-5211 x145