Topic: N131-007

FIRST RF CORPORATION

High Gain Common Data Link (CDL) Antennas for Networking UAV Nodes

FIRST RF is an advanced technologies company specializing in antennas and radio frequency (RF) systems in communications, radar, AESAs and Electronic Warfare. Under contract N68335-18-C-0566; topic number N131-007 High Gain Common Data Link (CDL) Antennas for Networking UAV Node, a multi-beam Ku-Band phased array system will demonstrate multi-node point-to-point network which allows multiple deployed units on land, air, or sea to transfer mission-critical information without relying on potentially vulnerable or oversubscribed space assets. Upon completion of airborne testing, a multi-beam TCDL antenna and radio communication system will have demonstrated a modular, low-cost, light weight, electronically steerable and multi-beam system capable of maintaining air-to-air, air-to-ground, and air-to-ship data links which will provide greater access to ISR and improves overall situational awareness to the fleet.

Technology Category Alignment:

Fixed Wing Vehicles (includes UAS)
Networks and Communications

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SYSCOM: NAVAIR
Contract: N68335-18-C-0566

Department of the Navy SBIR/STTR Transition Program

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NAVAIR 2019-884

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High Gain Common Data Link (CDL) Antennas for Networking UAV Nodes

FIRST RF CORPORATION

WHO

SYSCOM: NAVAIR

Sponsoring Program: Primary sponsor is Program Executive Office, Unmanned and Weapons (PEO U&W); endorsing is Multi-Mission Tactical Unmanned Aerial Systems (UAS) - PMA-266

Transition Target: MUDLAN is a potential Program of Record. It is anticipated that MUDLAN technologies will transition to a U.S. Air Force Program of Record

TPOC:
(301)757-5870

Other transition opportunities: Multiple opportunities exist within the Navy, Marine Corps, Army and Air Force for networked wideband communications. FIRST RF has targeted several programs within the services and approached several of the Common Data Link (CDL) radio primes to offer the MUDLAN MAINLINE AESA (Active Electronically Scanned Array) System.

https://airbornescience.nasa.gov/image/WB-57_6

WHAT

Operational Need and Improvement: MUDLAN supports the National Defense Strategy's focus on command, control, communications, computers, intelligence, surveillance and reconnaissance (ISR) and fully networked command, control and communications modernization. In FY 2018, MUDLAN demonstrated resilient networking that supports high data rate communications across multiple airborne and surface platforms operating in contested environments.

Specifications Required: Capability:
Four MAINLINE Arrays, 16 Beam CDL AESA
Array Controller (AIU), IP interface
Transceiver Signal Switching.
2 Array System – TD-1A 180 degree azimuth coverage
4 Array System – TD-1B 360 degree azimuth coverage
Size: 20.5" W x 3.5" D x 3" H; Weight: 12 lbs. per sector; Power: 315W per sector

Technology Developed: 4 Beam Transmit/Receive (Tx/Rx) CDL AESA with integrated switching to a 4 channel CDL radio systems per sector. 4 sectors makeup a full 360 azimuth coverage system.

Warfighter Value: FIRST RF has developed enabling highly directive multi-beam Tactical Common Data Link (TCDL) communications using phased arrays integrated onto the high altitude WB-57 platform. Phased array systems allow for dynamic beam steering with graceful degradation. Wide elevation patterns desirable for air-to-air or air-to-ground communications are achieved by using a linear array topology. These arrays also have the benefit of a narrow azimuth radiation pattern conducive to point-to-point communications and networking waveforms.The Rx/Tx AESA TCDL uplink and downlink channels allow for multi-beam functionality as well as the ability to simultaneously transmit and receive on each channel. FIRST RF's innovative approach leverages innovative phased array architecture to provide a highly functional TCDL communications node with multi-beam capability.

WHEN

Contract Number: N68335-18-C-0566 **Ending on:** August 19, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
System Integration Laboratory (SIL) – Testing	N/A	Preliminary Control Tests with AIU Emulator Array mock-up for fit check	TRL-4	March 2019
FIRST RF Integration and Test	N/A	Hardware Build Bench System Integration	TRL-5	May 2019
MUDLAN TD-1A Integration and Demo	N/A	SIL Integration, WB-57 Integration, Flight Tests	TRL-6	June 2019
MUDLAN TD-1B Integration and Demo	Med	SIL Integration, WB-57 Integration, Flight Tests	TRL-6	October 2019
Fabricate and test AESAs	Med	Improved RF Performance demonstrated/realized	TRL-6	May 2022
Radio and Aircraft Integration	Med	Improved RF performance demonstrated. Ground and Flight Tests	TRL-7	July 2022

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, Pointing Navigation and Timing (PNT), RF compatibility, low observable antennas, electronic warfare and direction finding RF systems. FIRST RF will produce the MAINLINE AESA arrays and integrate them onto a variety of aircraft types and sizes. Radio integration will likely be through a prime or directly with the Government.

Company Objectives: FIRST RF intends to quickly productize the MAINLINE Arrays for commercial and military applications. AESA sales at FIRST RF have continued to grow and represent approximately 30% of our overall sales.

Potential Commercial Applications: Commercial applications of this technology have been identified and include high bandwidth air-to-ground communications and internet for commercial aviation aircraft as well as AESAs for aircraft to satellite communication (SATCOM) systems.

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