

Topic: N131-007

FIRST RF Corporation

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

FIRST RF, an advanced technologies company specializing in antennas and radio frequency (RF) systems, is developing a low-SWaP, multi-beam Ku array system technology capable of full two-way multi-channel communications incorporating 360 degrees of TCDL networked communication links. This phased array system will enable single star network distribution and static/dynamic Internet Protocol address routing for up to 6 high-speed channels simultaneously without reliance on space communication assets. The System's low-SWaP, combined with its innovative, low-cost SMARt card architecture, make it ideally suited for integration on small UAV platforms (i.e. Fire Scout) serving as communication nodes to rapidly transfer mission critical information (i.e. imagery, data, command and control) up to a slant range of 110 nautical miles. FIRST RF seeks an air-platform partner for Unmanned Aerial Vehicle system integration.

Technology Category Alignment:

Satellite Communications (SATCOM)

Robotics/Automated Material Handling Equipment

Shipyards/Shipbuilding

Supply; Storage

Satellite Communications (SATCOM)

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Supply; Storage

Supply; Storage

Satellite Communications (SATCOM)

Shipyards/Shipbuilding

Robotics/Automated Material Handling Equipment

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Robotics/Automated Material Handling Equipment

Protection, Sustainment, and Warfighter Performance

Medical Chem-Bio Defense

Military Infectious Diseases

Propulsion and Extreme Environments

Fixed Wing Vehicles (includes UAS)

Survivability

Maintainability/Sustainability

Unmanned Ground and Sea Vehicles

Corrosion

Advanced Computing/Software Development

Networks and Communications

Modular/Open/Reconfigurable Architectures

RF Components for sensing, transmission and communication

Electronics Integration

Broadband/Multispectral Components and Systems

Sensors, Electronics and Photonics

Radio Frequency (RF) (non-EW)

Survivability

Broadband/Multispectral Components and Systems

RF Components for sensing, transmission and communication

Radio Frequency (RF) (non-EW)

Networks and Communications

Guidance, Navigation & Control (GN&C) and Data Links

RF Components for sensing, transmission and communication
Networks and Communications
Cognitive/Adaptive Capabilities
Preemptive/Proactive Effects
Broadband/Multispectral Components and Systems
Advanced Computing/Software Development
Networks and Communications
Personalized Assessment, Education, and Training
System Interfaces & Cognitive Processes
Aircraft Propulsion, Power and Thermal
Modeling, Simulation & Test Infrastructure
Rotary Wing Vehicles
Fixed Wing Vehicles (includes UAS)
Fixed Wing Vehicles (includes UAS)
Acoustic, Seismic and Magnetic
Rotary Wing Vehicles
Structures and Protection
Energy storage
Unmanned Ground and Sea Vehicles
Mobility
Power and Energy
Synthesis/Analytics/Decision Tools
Information Collection/Management
Advanced Computing/Software Development
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Energy storage
Power and Energy
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Maintainability/Sustainability
Advanced Computing/Software Development
EO/IR Components for sensing, transmission and communication
Microelectronics and Nanoelectronics
Networks and Communications
Mobility
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Human/Autonomous System Interaction and Collaboration
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System Interfaces & Cognitive Processes
Aircraft Propulsion, Power and Thermal
Power Generation/Energy Conversion
High Energy Lasers (HEL)

Propulsion
Biomedical Informatics / Health Information Systems & Technology
Protection, Sustainment, and Warfighter Performance
Modeling, Simulation & Test Infrastructure
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Electromechanical conversion
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Fixed Wing Vehicles (includes UAS)
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Protection, Sustainment, and Warfighter Performance

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Assuring Effective Missions
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Biomedical Informatics / Health Information Systems & Technology
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High Energy Lasers (HEL)
EO/IR Components for sensing, transmission and communication

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Acoustic, Seismic and Magnetic
Power Control and Distribution
Acoustic, Seismic and Magnetic
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Department of the Navy SBIR/STTR Transition Program

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NAVAIR 2016-768

Topic # N131-007

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

FIRST RF Corporation

WHO

SYSCOM: NAVAIR

Sponsoring Program: Fire Scout

Transition Target: MQ-8 C Fire Scout, Triton

TPOC:

(301)757-5870

Other transition opportunities:

FIRST RF's CDL antenna is applicable to a variety of Navy air, ground, and surface vessels. The high-gain, directional Ku CDL capability afforded by this low SWaP, bolt-on antenna system is capable of providing a low-cost, more secure, high-datarate CDL datalink to assets which currently have little to no datalink channel.

Notes: The FIRST RF TCDL multi-node antenna system allows for data links to be maintained between ground forces, ship-based platforms, and aerial units. The system will allow for ≥ 6 simultaneous nodes to maintain a data link at ranges of 110 nmi.



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WHAT

Operational Need and Improvement: Modern unmanned aerial systems (UAS) are requiring ever-greater data rates in wireless datalinks for command and control, as well as offloading of Intelligence, Surveillance, and Reconnaissance (ISR) data. One example is the Navy's Fire Scout platform. This unmanned ISR platform can be of critical operational importance in providing up-to-date ISR on enemy forces. However, the Fire Scout's extensive sensor arrays require dedicated, high-bandwidth datalinks. There is an urgent and growing need for long-range non-SATCOM, high-data-rate datalinks on Navy ISR UAS platforms. FIRST RF's multi-beam Ku array system meets the need to implement a fast multi-node point-to-point network which allows multiple deployed units on land, air, or sea to transfer mission-critical information without relying on space assets.

Specifications Required: Modular, Low-cost, and light weight

Supports 6 simultaneous nodes (12 beams)

Full duplex multi-beam BE-CDL system

Technology Developed: • Innovative, low-cost, SMARt card, modular array architecture allows for the simple scalability for increased performance and functionality

- Highly selective light-weight filters integrated on the front-end of the arrays allow collocated simultaneous transmit and receive operation
- Linear array topology features a narrow beam in azimuth and a fan beam in elevation for air-to-air or air-to-ground data links
- MMIC T/R module that can alternate between transmit and receive in both TCDL bands for air-to-air relay capability

Warfighter Value: With the addition of this upgraded BE-CDL antenna system, the MQ-8C will be able to support multiple simultaneous long range data links to both ship-based control terminals and directly with tactical forces on the ground. This dramatically improved, reliable connectivity to one of the Navy's premier ISR assets will impact a wide array of Navy and joint operations. The phased array is designed to be radio agnostic, allowing for seamless transitions to future radio development.

WHEN

Contract Number: N68335-14-C-0311

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Laboratory Prototype Fabrication/Test	Low	High-gain, multibeam connectivity of prototype system	4	March 2017
Networking and Radio Functionality Demo	Low	Routing and handoff, radio networking, advanced operational scenarios	5	November 2017
Airborne System Demonstration	Med	Operational connectivity, tracking, and high-speed data in airborne environment	6	January 2018

HOW

Projected Business Model: FIRST RF will produce the TCDL antenna system and will continue to coordinate with Cubic Technologies for radio integration. FIRST RF envisions that initial sales of the antenna system will be to Northrup Grumman and other airframe prime contractors and integrators for the MQ-8C Fire Scout. Future TCDL system sales intended for other platforms will be coordinated with those platforms' respective integrator and PMA.

Company Objectives: FIRST RF plans to transition this technology into a production-ready product. Efficient phased array integration approaches developed by FIRST RF will allow small platform system integrators to include advanced beamforming technology within the SWaP constraints of tactical UASs. The FIRST RF solution to enhanced TCDL connectivity for the MQ-8C Fire Scout and MQ-4C Triton will allow unprecedented flexibility for the warfighter and provide necessary capability for these systems to operate to a greater degree of effectiveness, providing higher fidelity ISR access as well as significantly improved situational awareness to Navy and joint forces.

Potential Commercial Applications: FIRST RF's patented phased array architecture is an enabling technology for advanced RF datalinks on UASs and other small platforms. This antenna system provides the performance of high-end electronically scanned radars at low size, weight, power, cost (SWaP-C), and thermal loads that are compatible with a variety of large and small platforms.

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