

Department of the Navy SBIR/STTR Transition Program

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NAVAIR 2016-922

Topic # N141-015

SBIR Phase II - Flightworthy Prototype (FWP) Low Profile Antenna for Multi-Band (Ka SATCOM, X Band option) including Ku band Tactical Common Data Link (TCDL)
Pacific Antenna Systems

WHO

SYSCOM: NAVAIR

Sponsoring Program: PMA 266

Transition Target: MQ-8B Fire Scout air vehicles

TPOC:

(301)757-1116

Other transition opportunities:

This compact, lightweight, low-profile airborne Ka Band antenna has applications on all aircraft including helicopter Through the Rotor (TTR), vertical take-off and landing tactical unmanned air vehicle (VTUAV) warfighters, in addition to planned and current UAV/UAS systems needing lower SWaP communications antennas can consider applying this antenna technology.

Notes: This technology creates potential DoD wide opportunity for Rotary Wing aircraft such as:

- 1) Ability to transmit and receive video (FMV, HD FMV, Radar) at BLOS ranges
- 2) Ability to command and control rotary wing VTUAV beyond LOS ranges
- 3) Remote Anti-Submarine Warfare (ASW) capability with high on-station availability



Courtesy of US Navy 141217-N-DC018-368 DEC 2014,
<http://www.navy.mil/management/photodb/photos/141217-N-DC018-368.JPG>

WHAT

Operational Need and Improvement: There is a need for a low profile antenna for Multi-Band (Ka SATCOM) including capabilities of operating at bandwidths up to 14 Megabits per second (MBS) Through the Rotor (TTR) while maintaining the same effective radiated power as standard size antenna apertures. Standard size satellite antennas have a greater height projection which creates greater aerodynamic drag. An antenna with a lower outward projection that does not sacrifice antenna gain, with full hemispherical coverage, does not currently exist. A prototype, low-profile, high data rate SATCOM antenna is being designed and fabricated during this project.

Specifications Required: The target weight of a Ka SATCOM Aircraft system (antenna, radome, modem and power amplifiers - excluding aircraft unique supporting structure) is 35 pounds or less for each antenna system. An antenna aperture diameter of 18 inches is the maximum allowable due to size constraints. Radome vertical height cannot exceed 15 inches. It is anticipated and planned that additional reduction of size, weight, and power of key components such as the monopulse tracking receiver, antenna control unit, pedestal positioner shall be necessary with the goal of attaining pre-production status.

Technology Developed: A compact, lightweight, low-profile airborne Ka Band antenna for wideband SATCOM on all aircraft including helicopter Through the Rotor (TTR) for greater than 10 Megabit/second throughputs. PAS reduced Size, Weight and Power (SWaP) providing payload advantage including a monopulse RF tracking RF feed for higher reliability and accuracy. The antenna system will include the pedestal positioner, monopulse tracking RF components, RF baseband equipment, and stabilization equipment including IMU and antenna controller.

Warfighter Value: This solution would enable a low-profile, lightweight, high bandwidth (Ka SATCOM) with hemispherical coverage. The antenna will utilize monopulse tracking for a reduced Size, Weight, Power (SWAP) form factor and high tracking accuracy. Additionally, State of the Art antenna/modem configurations is designed to support reliable Full motion Video (FMV) for high data rates for (TTR) application with the ability to command and control rotary wing VTUAV beyond LOS ranges.

WHEN

Contract Number: N68335-15-C-0341 **Ending on:** April 10, 2017

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Testing of Basic reflector geometry	Med	Test of reflector Antenna Gain in PAS Antenna Range	5	August 2015
Testing of High Bandwidth Digital Servo Controllers	Med	Prototyped in PAS lab; implemented on W-Band radar	5	October 2015
Testing of embedded antenna	Med	Successfully controlled PAS AD-100 TC DL	5	May 2016
GPS Tracking and accelerometer data in moving vehicle	Med	Capture data and verify accuracy using Google maps	5	June 2016
Antenna Gain testing of Gregorian antenna	High	Verify Antenna Gain and pattern geometry	5	August 2016

HOW

Projected Business Model: The overall technical objective of this program is to continue the development of a very affordable, low-profile high bandwidth through the rotor (TTR) SATCOM Antenna System that is at a very high TRL level (TRL level 6 or higher) and ready for preproduction. For the SBIR Phase II.5 Program, there are eight (8) NRE Spiral development cycles which include finalizing the performance criteria (to a high TRL level) for respective sub-systems, iterating and verifying performance requirements, interface requirements and re-procuring subsystem hardware.

Company Objectives: Pacific Antenna Systems design history includes over 70 years of Antenna Systems design experience in Communications, Radar and Electronics Warfare. To be an effective, high-bandwidth communications system from a rotary-wing platform a need exists for an Advanced Antenna with (BLOS) hemispherical coverage for ISR purposes. This PAS state of the art antenna and controller, with all RF components and modem will to allow a rotorcraft to participate in network concentric operations such as air to satellite, air to air and air to ground, using high data rate communications. Additionally, with the growing role of helicopters and VTUAV in anti-submarine warfare, high data rate communications a critical as raw sono-buoy data cannot be compressed as it is shared between platforms. The final program objective is a cost effective, complete, BLOS Antenna system including RF Transceiver and radio modem.

Potential Commercial Applications: As the OBSCAN technology Readiness Level increases, the advantages to both Rotary Wing for TTR mitigation and Fixed Wing & UAV communities needing "Dual Band, Dual Mode" communications capabilities shall solicited. OBSCAN shall have the advantage of affordability and can take the place of two antennas on certain platforms given the TC DL inherent capability and provides ISR data for incorporation into the Common Operational and Tactical Pictures (COTP) via Global Information Grid (GIG). Potential platforms for consideration include fire and police department helicopters.

Contact: Anthony Macari, Vice President / GM
anthony@pasantennas.com (805) 383 0700