

TOPIC NUMBER:
N142-114

TOPIC TITLE:
Small UAS HF/VHF/
UHF DF

**CONTRACT
NUMBER:**
FA8650-14-C-1738

**SBIR
COMPANY NAME:**
Applied Signals
Intelligence
Reston, VA

**TECHNICAL
PROJECT
OFFICE:**
AFRL Sensors
Directorate
Wright-Patterson AFB,
OH

PUBLISHED:
December 2016



A Navy RC-12 King Air with an Applied Signals Intelligence payload attached. This version uses the direction finder functionality developed under the Air Force SBIR Program to take unique spectrum measurements for the Office of Naval Research. (Courtesy photo)

A BETTER WAY TO FIND THE BAD GUYS

The Department of Defense is partnering with small business to develop a powerful new tool for tracking down adversaries.

Virginia-based Applied Signals Intelligence - with support from multiple services, including the Air Force Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Program - developed a direction finder for pinpointing enemy transmissions that is compact enough to fit on a small remotely piloted aircraft.

Until now, integrating a tool this complex into small RPAs wasn't an option.

Initially an Army SBIR topic, the technology went through additional development under the Navy and Air Force SBIR programs.

“The warfighter is the ultimate beneficiary and our tight coordination across the tri-services maximizes the value of the taxpayers’ dollars,” said Matthew Shuman, an electrical engineer at the RF Systems Branch of Air Force Research Laboratory’s Sensors Directorate.

BEHIND THE TECHNOLOGY

Adversaries use a wide range of widely available HF, VHF and UHF (High Frequency/Very High Frequency/Ultra High Frequency) push-to-talk radios for wireless command, control and communications. To counter those threats, intelligence operators use radios to find transmitters in the RF spectrum and direction finding equipment to get a fix on their positions.

High frequency direction finding technology has been around for years. However, these systems have traditionally been very large – as the aperture size was proportional to the wavelength of interest - and required a large platform to deploy.

Under the Air Force SBIR project, Applied Signals Intelligence addressed a major challenge of antenna size constraints and accuracy performance tradeoffs. This involved using aperture sizes that are a small fraction of the wavelengths.

The company first developed a ground-based, 2D direction finding system for the Army, which operates on electromagnetic waves propagating along the ground from vertical-oriented antennas. This works because the Earth shorts out other fields, however that same system can’t be used from the air as electromagnetic waves propagate in all directions and there is no ground to short them out.

To solve the issue, Applied Signals Intelligence quantified the airborne characteristics of its 2D system to create a 3D finding system – dubbed “precision DF” – for the Air Force. The 3D system operates on waves propagating in all directions and from all antenna orientations.

The company’s precision DF technology has already been tested on a small Navy plane and is in the process of being integrated into a small RPA by the Navy.

A WIDER LONG-TERM IMPACT

This advancement has the potential to greatly impact the Air Force intelligence, surveillance and reconnaissance mission, where there have been multiple capability gaps in the area of HF/VHF/UHF direction finding.

“Not only does this directly support our mission needs for direction finding, but for other mission requirements, where direction finding is a supporting technology that enables other advancement,” Shuman said. “A prime example of this is spectrum monitoring.”

The technology will continued to be developed with support from the Air Force SBIR/STTR Commercialization Readiness Program and a private sector company has already agreed to purchase several systems during the next few years to integrate and supply them to the military.

“SBIR funding allowed a small company to tackle this issue when larger and well established companies thought that this technology would never be possible,” said Martin Rofheart, CEO of Applied Signals Intelligence.



U.S. AIR FORCE

AIR FORCE SBIR/STTR PROGRAM

AFRL/SB | 1864 4TH STREET | WRIGHT-PATTERSON AIR FORCE BASE | OHIO | 45433
800-222-0336 | AFSBIRSTTR-INFO@US.AF.MIL | WWW.AFSBIRSTTR.COM