

TOPIC NUMBER:
AF153-002

TOPIC TITLE:
Handheld Dismount
Kit for Persistent,
Precision Navigation
in GPS-challenged
Environments for
Military Operations

**CONTRACT
NUMBER:**
FA8650-16-C-1718

**SBIR
COMPANY NAME:**
Echo Ridge LLC
Sterling, VA

**TECHNICAL
PROJECT
OFFICE:**
AFRL Center for
Rapid Innovation
and AFRL Sensors
Directorate
Wright-Patterson AFB,
OH

PUBLISHED:
August 2017



*Personnel from the 724th Special Tactics Group at Ft Bragg recently tested new navigation technology developed by Echo Ridge, a small business, in partnership with the AFRL Sensors Directorate. (Air Force photo)
Insert: The hand-held prototype developed by Echo Ridge. (Courtesy photo)*

NEW TECHNOLOGY SHOWS PROMISE FOR GROUND OPS TO SIDESTEP GPS JAMMING THREATS

Ground forces may soon be getting a new tool to find their way around hostile territory. With support from the Air Force Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Program, Virginia-based Echo Ridge LLC is developing a process to overcome GPS-contested environments by using radio frequency signals as a source of positioning information. The solution is designed to fit in a small package that can be carried by ground operators.

GPS has revolutionized warfighting by providing a ubiquitous, all-weather, absolute positioning, navigation, and timing capability that is unrivaled. However, many Department of Defense platforms have become overly dependent on GPS, making the signal a prime target for the enemy.

Under a special type of SBIR/STTR contract – known as a Direct-to-Phase II award, offered by the Air Force Research Laboratory Center for Rapid Innovation – Echo Ridge is working with the AFRL Sensors Directorate to solve this pressing issue.

BEHIND THE TECHNOLOGY

Adversaries use GPS jammers to disrupt allied operations as well as to protect themselves from attack by aircraft-launched precision weapons. These jammers deny access to the GPS signal for our ground forces in the region, making it difficult to navigate.

Echo Ridge developed and applied its technology to build a hand-held device that can provide navigation information to ground forces, according to Mark Smearcheck, an electronics engineer with the AFRL Sensors Directorate. The company worked to provide a complementary, backup source of positioning, navigation, and timing by creating an algorithm to aggregate signals of opportunity from various radio frequency sources. The algorithm is used to determine a position based on the time difference of arrival of those signals, which do not operate on the same frequency as GPS.

By receiving and processing various radio frequency sources not designed for navigation purposes, the new system can pinpoint a user's location without relying on GPS. The device connects to a smart phone running the Android Tactical Assault Kit, a device typically carried by Air Force ground operators, to display the navigation solution on a map.

With the process developed by Echo Ridge, the errors do not accumulate over time, as they might with a traditional dead-reckoning approach, so a valid position can be produced indefinitely. Additionally, multiple signal sources are used simultaneously, which provides redundancy and increased immunity to adversarial attack.

“We’re measuring signals that have known or discovered geographical locations,” said John Carlson, chief technical officer at Echo Ridge. “Because we’re able to precisely measure those signals, we can accurately estimate position without error growth over time or distance traveled.”

SPARKING INTEREST FROM OTHER FEDERAL AGENCIES

Funding provided by the Air Force SBIR/STTR Program allowed Echo Ridge to turn a laboratory concept into a prototype device in a small, low-power package.

Echo Ridge and the AFRL Sensors Directorate recently completed a field test and demonstration at Fort Bragg in North Carolina. The company is working to improve usability and address ruggedness issues that would position the device for wider use in the field. While still in the development phase for the Air Force, this technology has sparked interest from other potential federal customers.

“The Air Force SBIR/STTR Program really helps take some of the risk out of developing technology like this,” Carlson said. “The funding was absolutely critical to our efforts.”



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