

Department of the Navy SBIR/STTR Transition Program

DISTRIBUTION STATEMENT A. Approved for public release. Distribution is unlimited.

NAVAIR 2018-787

Topic # N14A-T009

Precise Positioning with Local Signal Carrier Phase Measurements and Global Positioning System (GPS) Fusion

GIRD Systems, Inc.

WHO

SYSCOM: NAVAIR

Sponsoring Program: PMA 213

Transition Target:

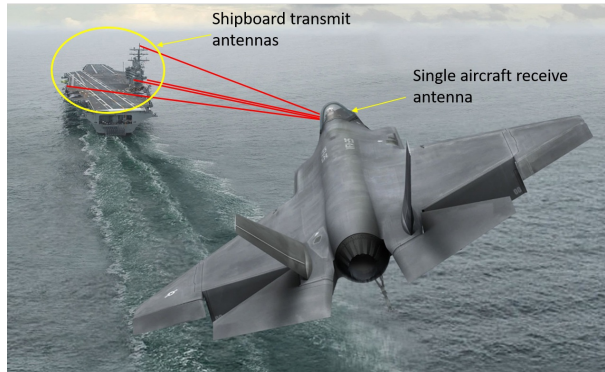
TPOC:

(301)342-2193

Other transition opportunities: All Department of Defense (DoD) systems that require precision navigation and landing in GPS-denied conditions will benefit from this technology. The technology applies to manned and unmanned aerial systems, rotary-wing as well as fixed-wing aircraft.

Notes: GIRD Systems is a small business defense contractor that is innovative and agile in satisfying the DoD's signal processing and communication needs. The APLS technology can integrate with navigation/landing systems utilizing existing comms radios, such as Link 16, or be deployed as a stand-alone system. APLS navigation can fuse GPS measurements, when available, as well as alternative PNT sensor data for GPS-denied environments.

www.girdsystems.com



GIRD Systems, Inc.

WHAT

Operational Need and Improvement: State-of-the-art navigation and landing systems are typically built around use of GPS. However, with increasing frequency, GPS is degraded or unavailable so its use as the sole source for precision navigation is compromised. As a supporting or potentially stand-alone alternative solution, carrier phase measurements in a local radio system of transmitters and receivers can be used for precise positioning within line of sight (LOS) distances. Such RF-based navigation technology can fill the need for augmenting GPS-based navigation systems to provide precision positioning when GPS is denied.

Specifications Required: High precision is required for aircraft landing in dynamic environments such as on the deck of an aircraft carrier. Depending on the application, at least sub-meter accuracy is required.

Technology Developed: The Alternative Precision Landing System (APLS) utilizes navigation signals transmitted from the aircraft carrier to enable the aircraft to self-position and navigate. Aircraft receiver algorithms have been developed to compute navigation metrics, and a navigation filter has been developed to fuse the navigation metrics, including GPS fusion, with other available navigation sensor measurements, such as the onboard inertial measurement unit (IMU). Prototype hardware has been developed to verify and demonstrate the navigation system over-the-air.

Warfighter Value: Positioning and navigation that are robust in contested and congested environments are of vital importance to the warfighter. APLS provides a complete navigation solution which can replace existing navigation filters, providing GPS fusion when GPS is available but fusing other positioning, navigation, and timing (PNT) sensors when GPS is unavailable. For the warfighter, APLS greatly enhances support for positioning/navigation-dependent missions in GPS-denied environments.

WHEN

Contract Number: N68335-17-C-0124 **Ending on:** April 1, 2019

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Non-real-time Over-the-air Operation	Low	off-line data processing verification	4	TBD
Real-time hardware implementation	Med	Laboartory verification in emulated environment	4	TBD
Real-time flight demonstration	Med	Precision navigation/positioning verified	5	TBD
Emulated relevant environment demonstration	Med	Precision navigation/positioning verified	6	TBD

HOW

Projected Business Model: GIRD will engage industry partners to assess the contribution of the technology and identify a strategy for the potential market and potential customers. GIRD will also potentially license the technology to primes and commercial business for their applications.

Company Objectives: Development of the robust navigation solution ties in with GIRD's long-term goal of becoming a leading provider of GPS-denied navigation and positioning technology to the DoD and other government and commercial sectors. GIRD's past and current GPS-denied positioning and navigation solutions for Navy SPAWAR and AFRL comprise major thrusts in this direction.

Potential Commercial Applications: The proposed local radio positioning system has potentially multiple advantages over GPS: less vulnerable to jamming, less sensitivity to multipath, faster carrier phase loop tracking and higher receiver dynamics. The developed system can be used for landing an aircraft on a ship, as well as many other applications requiring precision location information.

Contact: James Caffery, Jr., CTO
jcaffery@girdsystems.com 513-281-2900 x103