 WHEN  Contract Number: N68335-16-C-0166  Ending on: December 17, 2017

<table>
<thead>
<tr>
<th>Milestone</th>
<th>Risk Level</th>
<th>Measure of Success</th>
<th>Ending TRL</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Form Factor Test</td>
<td>Low</td>
<td>Demonstrate potential to achieve measurement accuracy</td>
<td>4</td>
<td>July 2017</td>
</tr>
<tr>
<td>Prototype Hardware for Sensor</td>
<td>Low</td>
<td>Complete integrated test and calibration</td>
<td>4</td>
<td>September 2017</td>
</tr>
<tr>
<td>Prototype Hardware for Tags</td>
<td>Low</td>
<td>Complete integrated lab test with sensor</td>
<td>5</td>
<td>October 2017</td>
</tr>
<tr>
<td>Final Form Factor Prototype Demonstration</td>
<td>Med</td>
<td>Demonstrate potential to achieve measurement accuracy</td>
<td>5</td>
<td>November 2017</td>
</tr>
<tr>
<td>Final Form Factor Prototype Flight Test</td>
<td>Med</td>
<td>Demonstrate potential to achieve measurement accuracy</td>
<td>6</td>
<td>December 2017</td>
</tr>
</tbody>
</table>

WHAT

Operational Need and Improvement: The US Navy has a significant fleet of nuclear carrier (CVN) based aircraft, both manned and unmanned, deployed in critical current and future sea-based aviation operational missions. A system is needed to increase safety and efficiency of those missions and to provide Precision Approach and Landing (PAL) guidance during at sea shipboard operations. The Navy Air Warfare Center - Aircraft Division (NAWCAD) 4.3.2 is exploring a variety of sensor technologies to support aircraft approach and landing activities through the Sea-Based Automated Landing and Recovery System (SALRS) Program.

Specifications Required: SALRS targets technologies that support unmanned aircraft operations or pilot augmenting capabilities. The basic SALRS requirement is stated as a sensor and processor system integrated with the air platform that detect, track and precisely navigate and land to a naval surface platform, from up to 10 nmi in range, at day or night, through thick cloud or fog cover, during heavy snow, or through heavy rain, in order to support an effective approach and recovery operation to the target ship.

Technology Developed: Technology Service Corporation’s (TSC) Location Identification & Flight Tracking System (LIFTS) is a multi-function system mounted on the aircraft with an intelligent Tag or set of Tags placed at designated landing locations. LIFTS provides precision guidance to the Tag(s) for a variety of mission scenarios. Employed to aid in landing or automatic extraction and deployment of cargo. LIFTS not only makes precision range and bearing measurements to the Tags for guidance but also establishes a datalink enables relay of data between Sensor and Tags.

Warfighter Value: Enables optimization of non-GPS precision ship-relative navigation system performance during tactical operations characterized by: degraded weather; high deck motion; and GPS denied, A2AD and jamming. Provides requisite capabilities to support execution of alternate missions (e.g., landings ashore, landings on non-surveyed ships, etc.), enable the creation of ship reference and aircraft cockpit displays for manned aircraft; facilitate automated aircraft carrier air traffic control.

HOW

Projected Business Model: TSC is an employee owned, small business engaged in providing systems engineering and electronics to the U.S. Government and Industry. TSC provides radar and sensor subject matter expertise, hardware and software development services to advanced technology clients. From its inception, TSC’s goal has been to hold a unique place among high technology firms for quality, on-time and within budget products, research and development, system engineering and analysis. TSC provides the analysis, development and support of RF systems, assemblies and subassemblies such as radars, missile electronics, communication systems and antenna assemblies. We perform the analysis, design, development, simulation, fabrication, integration and test of these electronic assemblies.

Company Objectives: TSC’s LIFTS technology is a promising cooperative pseudolite system design currently in prototype development, test and evaluation toward a Sea-Based Automated Landing and Recovery System (SALRS) type application. The Tags have the ability to store data and relay it to the LIFTS Sensor when requested. Data can be stored on the Tag prior to or in real time during the mission from the ship or from the aircraft-based LIFTS Sensor. This allows the LIFTS to provide area information as defined for the specific application in addition to providing guidance to the landing area or payload. Information can include any alpha-numerical data required, such as description, ship information, ship motion data, priority, etc.

Potential Commercial Applications: TSC’s LIFTS technology is easy adapted to support a diverse set of commercial applications e.g. automated cargo management (ACM) to include automated management of electronic manifests; and commercial aircraft landing optimization - the potential to support multiple simultaneous approach landing, reduced airspace congestion, and lower airport noise and emissions.

Contact: Brandon Wolfson, VP and General Manager
brandon.wolfson@tsc.com  256-535-2181

WHY

SYSCOM: NAVAIR
Sponsoring Program: Sea-Based Automated Landing and Recovery System (SALRS)
Transition Target: MQ-8 Fire Scout air vehicles (MQ-8B or MQ-8C) and X-47B Unmanned Combat Air System (UCAS) 
TPOC: (301)342-8548
Other transition opportunities:
- Manned aircraft, both fixed-wing and rotary wing, navigation and guidance (MH-60S Seahawk, MH-60R Romeo, MV-22B Osprey, K-Max)
- Capability to support Search and Rescue missions
- Capability to support Vertical Replacement (VERTREP)
- Capability to assist pilots in landing aircraft in restricted visibility conditions
- Capability to fully automate manned aircraft launches and recoveries
- Capability to enable automation of aircraft carrier air traffic control (ATC)
- Capability to support aerial refueling to extend flight operational envelopes

Disruptive Military Navigation Architectures
Topic # AF141-253
Technology Service Corporation