

WHO

**SYSCOM:** SSP

**Sponsoring Program:** Strategic Systems Programs

**Transition Target:** Defense contractor laboratories conducting system performance analysis of Navy INS

**TPOC:** [SSP.SBIR@ssp.navy.mil](mailto:SSP.SBIR@ssp.navy.mil)

**Other Transition Opportunities:** All maritime vessels, aircraft, self-guided missile systems, and other vehicles that use Inertial Navigation Systems



artist rendition of a submarine, courtesy USN,  
<https://www.navy.mil/Resources/Photo-Gallery/igphoto/2002347148/>

**Notes:** Inertial Navigation System Inspection and Detection of Evolving Roles (INSIDER) is a Condition Based Maintenance (CBM+) technology for Inertial Navigation Systems (INS). During training and testing, INSIDER simulates submarine INS data, including anomalous data, or injects degradations into pre-existing, real data. When operational, INSIDER first pre-processes time series INS data and ingests any additional sensor error codes. Second, INSIDER uses graphical models to determine relationships between sensor channels and the evolution of those relationships over time. Third, INSIDER applies forecasting models to measure deviances from expected values. Finally, INSIDER's flags and explains anomalies indicating the potential need for corrective maintenance.

WHAT

**Operational Need and Improvement:** Currently, operators and analysts manually examine Inertial Navigation System (INS) alerts and navigation outputs to identify faults and anomalies. INSIDER automates this process and finds more subtle faults, improving operator ability to proactively improve system condition and identify the need for maintenance. INSIDER:

- Reduces the rate of false positives;
- Reduces operator and analyst load;
- Anticipates faults and degradation; and
- Facilitates failure modes and effects analysis to improve system performance and reduce maintenance costs.

**Specifications Required:** The Navy seeks automated CBM+ tools to improve anomaly detection in Inertial Navigation Systems.

**Technology Developed:** Machine learning CBM+ models that automatically identify subtle INS anomalies and the need for corrective maintenance.

**Warfighter Value:** INSIDER improves the efficiency of post-patrol equipment analysis and increases the sensitivity and accuracy of anomaly detection over manual analysis methods. INSIDER augments analysts' performance in monitoring and sustaining the highest levels of operational readiness and performance. In future development, INSIDER will also operate on deployed INS and alert the crew of system degradation supporting better weapons system availability and performance and decreased lifecycle cost.

WHEN

**Contract Number:** N68335-22-C-0258      **Ending on:** Nov 17, 2023

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Prototype Pipeline	Low	Reasonable prototype performance on government-issued data	3	1st QTR FY21
Augmented Pipeline	Medium	Reasonable performance on simulated, difficult data	4	4th QTR FY23
Operational on Classified Data	Low	High performance on contractor provided data	5	1st QTR FY24
Operational in defense contractor laboratory environment	Low	High performance on post patrol data in DoD contractor laboratory	6	2nd QTR FY24

HOW

**Projected Business Model:** The first INSIDER transition will be to defense contractors supporting analysis of submarine INS post patrol data. During the upcoming Phase II Option, we will install INSIDER into defense contractor laboratories and integrate INSIDER into the post-patrol analysis pipeline. To achieve TRL-7, Boston Fusion will propose evaluating INSIDER on a Navy sea based testing platform. Next, Boston Fusion will market INSIDER technology for insertion on other Navy platforms such as CVNs and DDGs. Boston Fusion will explore development of low SWAP implementations for employment in US weapons systems.

**Company Objectives:** Be the preferred provider of revolutionary AI/ML solutions to fundamentally change the way national defense decisions are made.

**Potential Commercial Applications:** INS units are used in a large number of commercial applications.