

Topic: N141-054

## Intelligent Automation, Inc.

### Predictive Condition-Based Maintenance for High-Powered Phased Array Radar Systems

Radars are a fundamental component of a surface combatant ship's mission and are a key contributor of individual ship and battlegroup Operational Availability (AO). IAI, a research organization with extensive experience developing cutting edge software solutions, is developing a predictive condition-based maintenance (CBM) tool designed for high-powered phased array radar systems to provide continuous online health monitoring and system maintenance recommendations. This tool, Reliability Analysis enhanced Prediction System (RAPS), provides a ranked list of components and associated maintenance requirements that need attention, as a result this may lengthen the system's operational life, ability to forecast failure, and determine component/system Remaining Useful Life (RUL), based on historical fault data and real time system monitoring. RAPS has the potential to increase AO, improve maintenance efficiency, and reduce costly unscheduled maintenance.

### Technology Category Alignment:

Advanced Electronics

RF Components for sensing, transmission and communication

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**SYSCOM:** NAVSEA

**Contract:** N00024-16-C-4012

 Corporate Brochure: [https://navystp.com/vtm/open\\_file?type=brochure&id=N00024-16-C-4012](https://navystp.com/vtm/open_file?type=brochure&id=N00024-16-C-4012)

# Department of the Navy SBIR/STTR Transition Program

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NAVSEA #17-537

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Predictive Condition-Based Maintenance for High-Powered Phased Array Radar Systems

Intelligent Automation, Inc.

## WHO

**SYSCOM:** NAVSEA

**Sponsoring Program:** PEO IWS 1.0F

**Transition Target:** U.S. Navy Ships

**TPOC:**  
(202)781-4420

**Other transition opportunities:**  
Any program wishing to support SWE S&T Objective SID STO-1 & 2, WP STO 5 & 6, and PDS STO 1 & 2

### Notes:

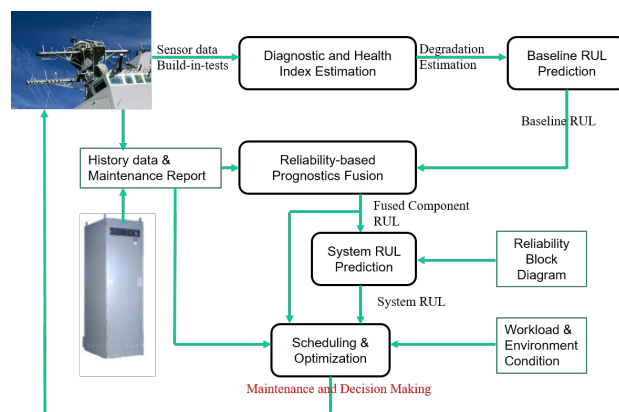
PEO IWS: Program Executive  
Office Integrated Warfare Systems  
PEO IWS 1.0F: Aegis Fleet Readiness Office

SWE STO: Surface Warfare Enterprise Science and Technology Objective

SID: Strike and Integrated Defense

WP: Warfighter Performance

PDS: Platform Design and Survivability



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## WHAT

### Operational Need and Improvement:

The Navy seeks an innovative condition-based maintenance technology (i.e., a predictive condition-based radar maintenance forecaster) that can use adaptive learning techniques to "understand" component inter-dependencies and can accurately predict component failure of radar transmitters based on all available parametric data.

### Specifications Required:

An innovative expert system that continuously monitors the radar to assess the component and system health to predict future degradation and failure.

### Technology Developed:

A predictive condition-based maintenance (CBM) tool designed for high-powered phased array radar systems to provide continuous online health monitoring and system maintenance recommendations. Based on historical fault data and real time system monitoring, our software tool provides a ranked list of components and associated maintenance requirements that need attention by forecasting failure and determining component/system Remaining Useful Life (RUL).

### Warfighter Value:

- Improved Operational Availability
- Increased Mission Readiness
- Reduced Total Ownership Costs
- Reduced Lost Mission Days

## WHEN

**Contract Number:** N00024-16-C-4012 **Ending on:** November 4, 2017

| Milestone  | Risk Level | Measure of Success   | Ending TRL | Date          |
|--|------------|--|------------|---------------|
| Achieve TRL 4  | Low        | Individual SW modules work   | 4          | October 2016  |
| Achieve TRL 5  | Low        | Develop SW modules that work collectively                              | 5          | November 2017 |
| Exercise Option II of Contract                       | Low        | Option Exercised   | 5          | December 2017 |
| Achieve TRL 6  | Med        | Successful Test and Delivery of RAPS                                   | 6          | October 2018  |
| RAPS Integration and Testing on a Phased Array Radar | High       | Successful Integration and Testing of RAPS within a Phased Array Radar | 7          | December 2019 |

## HOW

### Projected Business Model:

Prognostics is the corner stone of any Condition Base Maintenance Plus (CBM+) solution. The underlying technology is system agnostic and can be applied to many difference fields (e.g., Cybersecurity, Prognostics and Health Management, National Air Space, Traffic Monitoring and Control, etc.). We will be incorporating it in to our existing products as well as licensing the technology.

### Company Objectives:

IAI is a technology innovation firm that matures concepts to functional prototypes, productizes its prototypes, and commercializes its innovative products through extensive government and industry partnerships. The RAPS technology is a fundamental component to many government and industry needs and will be used across our products to the benefit of our government and industry customers.

### Potential Commercial Applications:

RAPS is system agnostic. The state-of-the-art prognostics system we have developed learns from component and system behavior to identify anomalous states. From historical and reliability data, prediction of future degradation and failures can be made within high confidence bounds. Any system that collect sensory information that wants to reduce cost associated with their Preventive Maintenance System would benefit greatly.

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