

# NAVY Transition Assistance Program

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## NEED & CUSTOMER REQUIREMENT

**Need:** Unmanned situational awareness of system lubrication health and automation of maintenance tasks is a key enabler condition based maintenance. Submarines and surface ships make extensive use of hydraulic oil and gearbox and engine lubricants. The Navy and other DoD departments currently have no direct, in-line chemical analysis-based oil health monitoring capability. Most, if not all, infer or derive oil health from physical property measurements and/or algorithms. An in-line device to monitor degradation of gearbox and hydraulic oils in real time is needed to achieve Navy safety, CBM and manning requirements.

**Value to the Warfighter:** Reduced man-labor, improved situational awareness and maintenance automation of systems, enhanced system safety, increased operational readiness, lower maintenance cost.

**Operational Gap:** The Navy has no automated, in-line oil health monitoring capability. Adding this capability will reduce manpower and maintenance costs, provide improved situational awareness and anticipate potential catastrophic failure events (i.e. thermal coking).

**Customer Specifications:** Equal or better assessment capability than that provided by current conventional methods, absolute measure of oil quality, and operate unattended in a shipboard environment. The system will alert maintenance staff if an error condition is detected via either a data interface (TBD) or a light (green / yellow / red).

**Technology Description:** Miniature electron spin resonance spectrometer which measures concentration and composition of free radicals caused by the oxidation process. Easily integrated in-line oil health monitor provides more automated maintenance, higher safety, reduced manning, low system life-cycle cost at low risk.

## TECHNOLOGY DEVELOPMENT MILESTONES (SBIR/STTR)

Milestone	TRL	Risk	Measure of Success	TRL Date
Demonstration of operational X-band sensor	4	Low	Measure thermal oxidation and thermal coking signals in gearbox and hydraulic oil.	9/15/2010
Demonstration of X-band Micro-ESR on test bench @ Pax River	5	Moderate	Measure thermal oxidation in real time and correlate to offline Navy tests.	1/28/2011
Installation and test of X-band Micro-ESR in a marine environment.	6	Moderate	Measure degradation of lubricants in real time.	TBD

Open contract: N00024-10-C-4105 ending 11/2/2011

N08-051 - Active Spectrum, Inc.

In-situ Measurement of Marine Lubricant Degradation by X-band Micro-ESR Spectrometry

## SPONSORSHIP of original SBIR/STTR Topic

**SYSCOM:** NAVSEA

**Transition Target:** Surface Ships, Submarines, Carriers

**Original Sponsoring Program:** NAVSEA Directorates

**TPOC Phone Number:** 757-312-0542 Ext. 230

**Note:**

In-line oil health monitoring system based on X-band Micro-ESR sensor technology.



## TECHNOLOGY TRANSITION OPPORTUNITIES (PHASE III)

**Other Potential Applications:** Military and commercial ships, trucks, trains, aircraft, etc.. The underlying physics used for detection enables this technology to readily transition to other applications as well: food industry to measure oxidative state of beer, wine, solid foods for shelf life, asphaltene and vanadium measurement to determine quality of crude oil, and bio-medical detection of reactive nitrogen and oxygen species.

**Business Model:** Active Spectrum intends to manufacture the Micro-ESR oil condition monitoring system; sell backfit units direct to program offices and forward fit units to ship and submarine builders and system integrators such as Northrop Grumman, General Dynamics and Lockheed Martin and other commercial markets.

**Objective:** Our objective is to initiate relationships with Ship, Submarine and Carrier program offices, shipbuilders and LSI's to incorporate the device into shipboard generator and actuator health monitoring systems.

**Company:** Active Spectrum, Inc.

**Contact:** Dr. James White

**Email:** jwhite@activespectrum.com

**Phone:** (650) 212-2625