

## **A Plug-and-Play Module for Assessing Real-Time Mission Readiness Using Subsystem Health and Interactions**

### **SUMMARY**

Impact Technologies, LLC. will to develop and demonstrate mission readiness assessment techniques using component and subsystem health indexes in an open systems architecture (OSA). The proposed work will utilize mission requirements, component health states, and potentially available models to develop a plug-and-play software module that can be used to assess system mission readiness in real-time. The development will include algorithms to account for subsystem interaction and relate independent subsystem health indicators to overall system readiness. Prognostics will also be included to predict future readiness levels for specific missions. This information will ultimately be utilized for decision support of Navy ship systems.

Specifically, the core innovations of the proposed project include:

- 1)** Use of gray scale health to assess mission readiness
- 2)** Fusion of multiple independent health state indicators to determine overall system health; and
- 3)** Development of a prognostics approach that accounts for the effects of fault propagation between interconnected subsystems by defining propagation paths and adjusting failure rates accordingly.

### **ANTICIPATED BENEFITS / POTENTIAL COMMERCIAL APPLICATIONS**

This decision support technology will help future Navy combatant ship programs, such as DD(X), reach reduced manning objectives and total ownership cost initiatives, while still providing significant combat advantage. These objectives will be achieved through more informed mission planning and maintenance execution. In addition, availability will be increased through a greater understanding of system readiness to allow improved asset allocation. Because effective military operations require accurate knowledge of an asset's health and damage state, there exist numerous potential military applications for the proposed automated mission readiness assessment system, including platforms in all branches of the U.S. DoD. ***With the adaptable nature of the core analysis techniques proposed, the developed approach and design products could be adapted for a variety commercial applications, including: commercial airlines, land and marine propulsion systems, large utilities and independent power producers, oil and gas transmission companies, and processing industries.***

**Keywords:** Mission Readiness; Condition-Based Maintenance (CBM); Subsystem Health; Subsystem Interaction; Prognostics; DD(X); OSA-CBM;