Exhibit 1: Government contract narrative

(Excerpt from RIT FY2004 Federal Funding Request)

Agency: Office of Naval Research
Contract Number: N00014-99-1-0154
ONR Program Manager: Dr. Paul Rispin
Department of the Navy
Office of Naval Research
800 North Qunicy Street
Arlington, VA 22217-5660
Tel. (703)696-0339
Fax (703)696-4884

Program 1:
Asset Health Management

In asset health management, embedded systems monitor equipment health.

The global political environment drives the need for small, rapidly deployable, mobile force structures and, as a result, new concepts of logistical support. In support of this need, the Department of Defense is introducing new weapon systems platforms that are both increasingly sophisticated to operate and maintain and that are expected to remain in service for many years. Existing systems are being required to operate well beyond their original design life.

Improved readiness of new and existing weapons platforms and improved battlefield information access are necessary to meet the military needs of the early twenty-first century. These challenges must be met without increasing operations and support costs or manpower requirements.

Asset Health Management: A Key to Enhanced Readiness

Asset health management systems enable better decision making with respect to equipment operation, maintenance, recapitalization and disposal. In addition, the information provided by asset health management systems can aid in the planning, execution and logistics support of military missions.

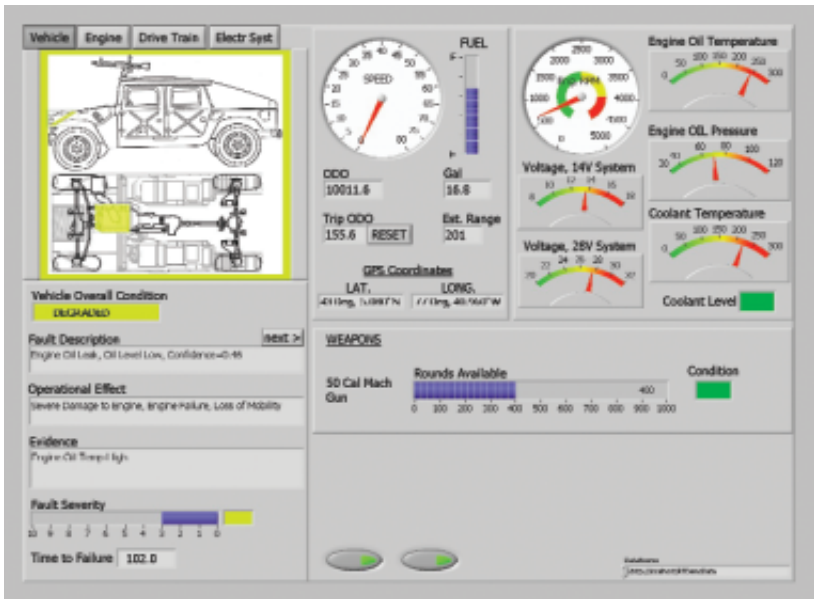
In order to better manage the readiness and cost of military equipment, data must be readily available across the Department of Defense (DoD) enterprise. Recognizing this, the Department of Defense is developing and deploying information systems that will support the transmission, management, and global access to critical military information. This capability will provide a backbone for enterprise-wide systems for managing and ensuring equipment readiness (asset health management).

Pilot applications include five LAVs on loan from the U.S. Marine Corps., to be extended to 25 vehicles.

Better management of equipment readiness and cost requires that more information than is currently available be recovered from equipment in the field. Asset health management involves:

- Utilizing existing and new sensors on an integrated platform data network;
- Embedding within platforms knowledge systems that detect and predict failures, warn operators and maintainers of potential failures, and provide guidance to extend the operational life and diagnose and repair failures that do occur;
- Utilizing commercial and military communication networks to provide an integrated data environment; and

- Centralized tools that enable better life-cycle decisions for individual platforms and also improved fleet management policies.



Operator's advisor for humvee, under development at NCR³

The illustration on the following page shows a vision for asset health monitoring and logistics support. Equipment readiness is monitored continuously, rather than only after equipment has failed. Platform health monitoring reduces maintenance effort by enabling condition-based maintenance. It also provides diagnostic assistance, reducing the training and skill requirements for maintainers of both existing and newer, technologically advanced equipment. The ability to predict future failures or maintenance needs provides the ability to respond proactively to problems; it enables a whole new paradigm for mission, operations, maintenance and logistics support planning.

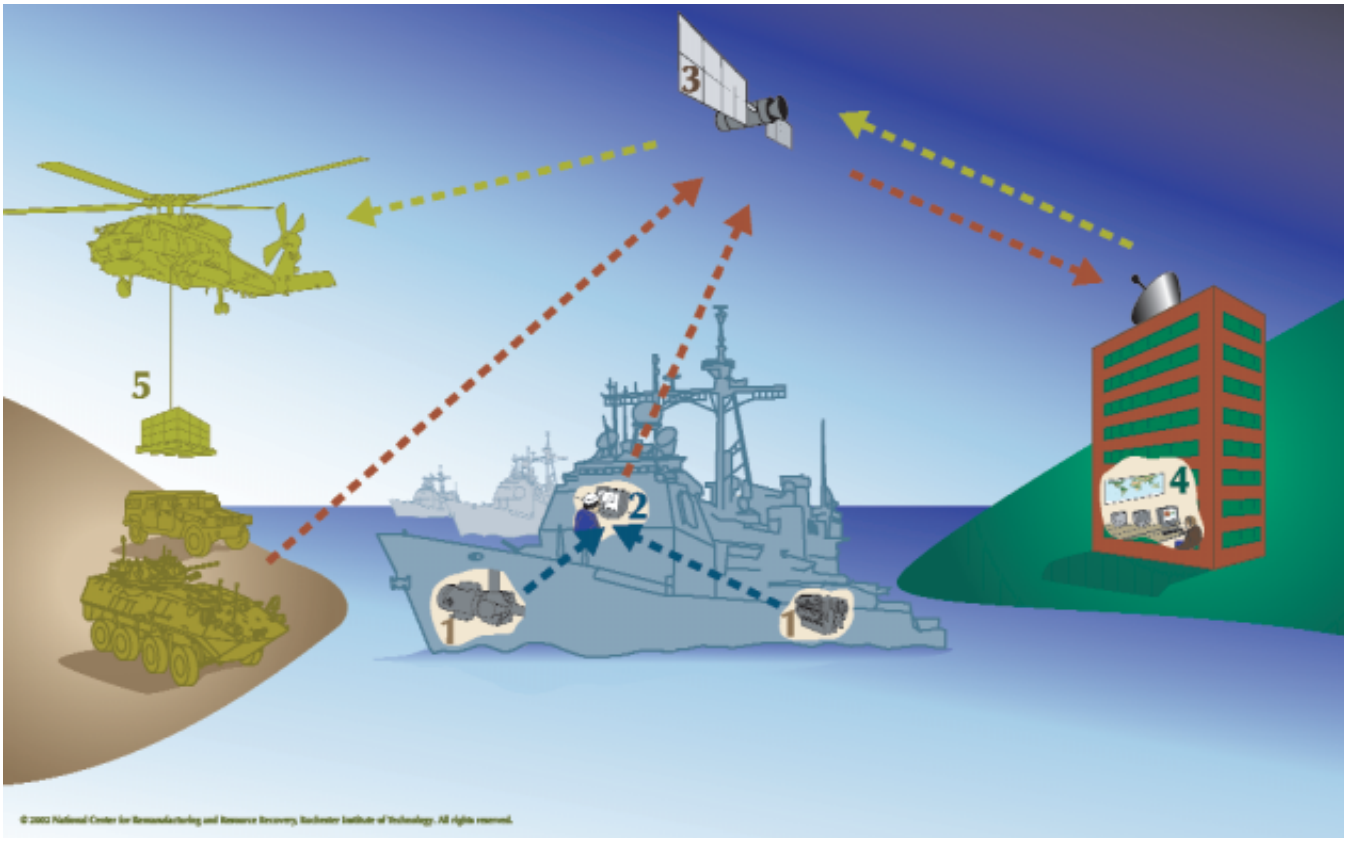
Given health records for available equipment, mission planners can optimize assignment of equipment for all mission tasks based on the operational requirements and mission criticalities. In addition, equipment problems or supply needs during mission execution can be rapidly responded to by deploying maintenance teams or supplies or by reassigning assets to replace failed or degraded equipment.

Research

The NCR³ asset health management program is based on a strong foundation of industrial experience in remanufacturing and sustainability and reliability engineering. In addition, significant advances on Marine Corps platforms have been demonstrated. Based on NCR³'s unique expertise, the research focus includes: the development of technology that will detect and predict failures on electrical and mechanical equipment (system health monitoring), the development of on-board systems that support operational and maintenance decisions (platform asset management), and integration of NCR³'s life-cycle decision support tools (platform asset management, or remote support and monitoring). These research efforts will be guided by concurrent application to DoD platforms that require sustainability support.

At the platform level, the asset health management program will assess the system and component failure modes and develop strategies for detecting and diagnosing them. A critical issue in the application of this technology is the implementation cost versus the benefit of monitoring. NCR³'s approach is to utilize existing sensors

Asset Health Monitoring and Logistics Support Model



1 System Health Monitoring

Sensors are placed on all key systems. Smart systems report their health based on sensor data. Considered data may include temperature, vibration, noise, contaminants in oil and other performance criteria.

2 Platform Asset Management

System health information is used to support decisions with respect to platform and equipment operation, maintenance, and life-cycle management.

3 Platform Status Reporting

Data transmitted from each platform includes only that information necessary for fleet monitoring, support and supply.

4 Remote Support and Monitoring

Fleet Health and Operations Monitoring — the ability to maintain extensive historical databases across the fleet enables knowledgeable personnel to make platform and fleet life-cycle decisions.

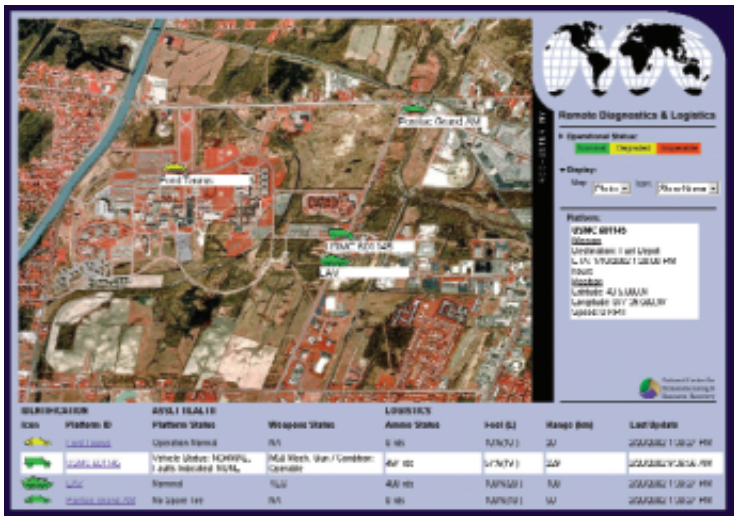
Technical/Logistical Support — on-platform personnel have access to remote government and contractor engineers for problem resolution. Actual or forecasted failures would trigger supply systems.

5 Resupply

Resources such as fuel, ammunition and in-field maintenance material are then transported to those platforms requiring support.

and signals and to assess the value of any new instrumentation against the failures that the monitoring system will detect and prevent.

Prediction of future failures (prognostics) is an area of significant research need and has a large potential payback. While diagnostic technology enables improved reactive response to failures, prognostic technology enables proactive planning and failure prevention. The core research of characterizing the physics of failure at the material and component level is being done within the materials aging program. The asset health management program will integrate the material aging models within the embedded health assessment system.



Command and control view of fielded assets

Platform status reporting is also an important consideration in the development of the asset health management system. NCR³ will work with various DoD programs that are interested consumers of platform health data. NCR³'s baseline approach in the area of real-time status reporting will be to optimize the transmitted information to a minimum set of critical platform information. Special message structures and communications protocols will be developed to support occasional requirements for more detailed data. The system must also support rapid streaming of complete asset health databases when platforms return to their base of operations.

In remote support and monitoring, NCR³'s focus will be on linking the information generated on the platform with the Life-cycle Engineering and Economic Decision support tool. This tool will aid asset health managers in deciding when specific assets need to be overhauled, remanufactured, upgraded, or disposed.

Work Plan

NCR³ has applied asset health management technology to a variety of industrial applications. The most recent work involved the development of a test system to assess the health of automotive constant velocity joints for the automotive industry. This program included the development of a unique hardware test methodology, as well as optimized data processing algorithms to quantify and qualify defects.

NCR³ is applying this experience, as well as industrial data acquisition and sensing experience, to the development of asset health management technologies for military ground vehicles. This will be a multi-year initiative, which will increase in scope and will also interface with an Office of Naval Research program in future years.

Platform asset management is focused on supporting decisions with respect to operating and maintaining equipment.

The pilot applications have been on the High Mobility Multi-Wheeled Vehicle (HMMWV or humvee) and two light-armored vehicles (LAVs) from the United States Marine Corps Material Command in Albany, GA.

Pilot Program:

- Continue development of diagnostic and prognostic technology for DoD ground vehicle systems
- Implement the hardware and software for embedded health assessment systems on the ground vehicle
- Develop and implement an on-board platform health advisory for ground vehicle operators and maintainers
- Interface the platform health assessment system through a wireless communication network to a central command and control station

In addition, RIT has been selected by the Marine Corps as the site for the light armored vehicle (LAV) Advanced Technology Demonstrator. This vehicle will be the demonstrator and test bed for the next generation of LAV upgrades, and includes a role in the development of new technologies as well as responsibility for installation and testing of all proposed technology and performance upgrades. Also, RIT will install and test the Corps' proposed service life extension program (SLEP) modifications for the current generation upgrades.

The Naval Aviation Depot Jacksonville has identified a need to improve the availability and performance of critical machine tools in the remanufacturing process. Certain highly specialized tools, if unavailable, would dramatically reduce the throughput and productivity of the Depot. NADEP Jax has proposed that RIT develop and install an asset health management program for these critical machine tools. We propose to leverage our expertise gained in similar activity for commercial customers, to develop and implement a solution for the Navy at the Jacksonville site initially, with potential application in all Navy industrial facilities.

In subsequent years, NCR^3 will expand the on-board monitoring to include additional platform subsystems. NCR^3 will also interface the on-board monitoring system with systems being developed by the Marine Corps and the Office of Naval Research (Autonomic Logistics Program). This ONR program is developing the communications architecture, command and control tools, and logistics support tools for Marine Corps expeditionary units. The on-vehicle monitoring system will provide the platform data to be used by the decision support tools for command and control and logistics.

An additional future effort will integrate the platform health data with a remote system for engineering decision support. The LEEDS™ (Life-cycle Engineering and Economic Decision Support) software system will provide decision support for asset health management.