

# technology **today**

HIGHLIGHTING RAYTHEON'S TECHNOLOGY

2006 Issue 2



**RAYTHEON MISSION SUPPORT**  
Delivering superior technology  
and solutions our customers can count on

**Raytheon**

*Customer Success Is Our Mission*

# Mission Support: How SmartSignal Helps It Happen

Mission Support is Raytheon's process of enabling customer readiness by providing total life-cycle support that predicts customer needs, senses potential problems and responds proactively with appropriate solutions to enhance availability and reliability and facilitate Mission Success. Raytheon's Mission Support ReadLog™ Integrated Solution Sets are the modules used to implement Mission Support. In turn, they are composed of elements that allow Raytheon to tailor solutions to specific client needs.

One of the Integrated Solution Sets is Condition-Based Maintenance (CBM), which provides real-time health assessment and action systems. A critical element of Raytheon's CBM solution set is SmartSignal™ Corporation's EPI\*Center™.

Just as Raytheon is a leader in radar and missile systems, SmartSignal is the leader in equipment predictive analytics. SmartSignal's unique technology was originally developed at Argonne National Laboratory for monitoring nuclear power plants. To commercialize the technology, SmartSignal was created in the late 1990s. Since its inception, SmartSignal has successfully provided predictive-analytic support for some of the market leaders in the aerospace, power generation, oil and gas, and mining industries, for organizations including Delta Airlines, Southwest Airlines, Caterpillar, Entergy, Ameren, Reliant Energy, Calpine and TransAlta.

Through use of SmartSignal's EPI\*Center software solution, Raytheon's CBM offering can detect equipment problems before they lead to failure and loss of availability. SmartSignal's EPI\*Center is used across all types of equipment, improving equipment reliability and availability and reducing maintenance costs. SmartSignal and the other elements in the CBM solution set create an integrated, net-enabled environment for Raytheon customers and deliver actionable information to optimize equipment readiness.

## What exactly is SmartSignal's EPI\*Center, and how does it work?

Unlike other condition-based monitoring



techniques, EPI\*Center software analyzes a machine's operating history and uses proprietary algorithms to describe normal activity under varying load and operating conditions. Using data generated from equipment sensors, EPI\*Center creates a model that captures the relationships among the sensors. It then analyzes all the sensor data in real time, 24/7, comparing the new data with the historical model, highlighting and focusing attention on only the readings that are irregular compared to similar conditions.

SmartSignal's EPI\*Center sifts through mountains of sensor data, allowing technicians to focus on only what needs to be fixed — and not on what doesn't. When EPI\*Center detects anomalous behavior, it places the equipment in question on the "Watchlist." Through the Watchlist and its links to operational data, technicians can determine appropriate maintenance actions. In addition, once repair activities are done, technicians can track performance to make sure the repairs were properly completed.

EPI\*Center alerts Raytheon customers of problems before they become serious, supporting maximum availability and reliability, and helping ensure mission success. SmartSignal also helps Raytheon's customers by moving unplanned maintenance to planned, lengthening maintenance intervals, optimizing maintenance and technician productivity, and reducing unnecessary spare parts.

One of the many unique aspects of the patented EPI\*Center, versus traditional condition-based monitoring techniques, is that EPI\*Center recognizes that *every piece of equipment* is an individual. It realizes that even identical pieces of equipment:

- were manufactured by different people at

different times;

- have different parts, tolerances and metallurgy;
- are operated and maintained differently; and
- operate under different loads and different conditions.

Accordingly, EPI\*Center creates serial-number-specific models, allowing for fine-tuned predictive capabilities for each individual piece of equipment.

In the commercial airline industry, EPI\*Center is used to detect emerging jet engine problems. Over a six-month period, EPI\*Center helped one aerospace company avoid the following problems for its fleet of jet engines:

- 7 in-flight shutdowns
- 6 flight diversions
- 7 unplanned aircraft out-of-service
- 15 flight cancellations
- 13 flight delays
- 5 out-of-station engine shipments
- 6 core-engine failures
- 4 exhaust gas temperature exceedences
- More than 65 fan vibration balance problems

All told, avoiding these problems saved the company millions of dollars.

SmartSignal's EPI\*Center is unlike any other type of predictive-analytic solution. Through its use of proprietary algorithms, historical data, inter-relationships of sensors, real-time analysis and equipment-specific models, it provides the best possible predictive analyses of potential problems. As a critical element of Raytheon's Condition-Based Maintenance solution set, SmartSignal's EPI\*Center facilitates Mission Support and does its part to ensure mission success. ●

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# Future Events

## 16th Annual INCOSE (International Council of Systems Engineering) International Symposium *Systems Engineering: Shining Light on the Tough Issues* **CALL FOR REGISTRATION**

July 9–13, 2006  
Orlando, Florida

Come to Florida and learn how the theme "Systems Engineering: Shining Light on the Tough Issues" applies to the broad scope of systems engineering and how systems engineering activities in commercial, academic, and government environments are converging on new best practices and novel technologies and methodologies. Many fine papers, panels and tutorials covering case studies, developmental work and technical analysis have been received, reviewed and scored; and the technical program is being set. Arrangements are being made for keynote speakers and special events that will be both entertaining and fascinating.

For information or to register, please visit: <http://www.incose.org/symp2006/index.php>

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## 2006 MMTN Symposium **CALL FOR REGISTRATION**

Sept. 12–14, 2006  
Boston Marriott Quincy Hotel  
Quincy, Massachusetts

The 6th annual Mechanical and Materials Engineering Technology Symposium will be hosted in Massachusetts by Integrated Defense Systems and the Mechanical Engineering Directorate. Co-sponsored by the Mechanical and Materials Technology

Network (MMTN) and the Mechanical Engineering and Technology Council, the MMTN symposium will be held in Quincy, Mass., not far from the revitalized Boston Harbor waterfront. The symposium provides an excellent opportunity to gain insight into the technology innovation at Raytheon and the people that contribute to it.

For information or to register, please visit: <http://home.ray.com/rayeng/technetworks/tab6/mmtn2006>

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## 10th Annual Raytheon Processing Technology Expo *Innovation in a Competitive Marketplace* **CALL FOR REGISTRATION**

Oct. 3–5, 2006  
Richardson Hotel  
Richardson, Texas

The 10th Annual Raytheon Processing Technology Expo will feature three days of presentations, exhibits and workshops in all areas related to signal and data processing technology.

The Processing Technology Expo is an excellent opportunity for Raytheon technologists and engineers to exchange ideas with others working on processing-related projects and interact with leading customer representatives. This year's event will focus on Raytheon innovation in an increasingly competitive marketplace. Customer desires for use of commercial-off-the-shelf (COTS) technology brings new challenges — technology refresh and obsolescence, software portability and efficiency, and hardware ruggedization. For many applications, COTS technology at the system, board or even component levels is not the best solution.

The expo provides a forum to increase awareness of Raytheon's experience in these and other areas of processing technology.

For information or to register, please visit: <http://home.ray.com/rayeng/technetworks/tab6/pstn2006>

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## 6th Annual CMMI Technology Conference and User Group **CALL FOR REGISTRATION**

Nov. 13–16, 2006  
Hyatt Regency Tech Center  
Denver, Colorado

The Systems Engineering Division of the National Defense Industrial Association, in conjunction with the Software Engineering Institute, Carnegie Mellon University, is pleased to announce the 6th Annual CMMI® (Capability Maturity Model® Integration) Technology Conference and User Group.

The purpose of the conference is to exchange ideas, concepts and lessons learned concerning the continuing evolution, adoption and use of CMMI and its associated appraisal (assessment and evaluation) methods. This conference brings together CMMI adopters, users, developers and appraisers, as well as those with general interest in process improvement. It provides a forum for the free exchange of ideas and affords a unique opportunity to meet with the sponsors, developers and stewards of CMMI, as well as those offering training and implementation assistance.

For information or to register, please visit: <http://www.ndia.org/Template.cfm?Section=7110&Template=/ContentManagement/ContentDisplay.cfm&ContentID=10838#papers>

## Raytheon

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