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HIGHLIGHTING RAYTHEON'S TECHNOLOGY

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

Raytheon

Customer Success Is Our Mission

The Architecture of Mission Support

Raytheon has applied a systems approach to the development of Mission Support. This represents the vision of Mission Support to which we aspire.

Mission Support involves the entire life cycle of the system. The system may be a product such as a missile, a radar or a satellite; it may be a platform such as DDG 1000 or an F-18 E/F; or it may be a military unit's equipment to perform a mission. Each represents an increasing level of Mission Support integration. The object systems need not be military. Every agency or company has missions and each of these missions is performed by assemblages of equipment, people and processes. The equipment, people and processes require sustainment to maintain their operational ability to perform the mission.

Figure 1 represents the operational view of Mission Support. It is not cast in a purely military framework; the green areas in the figure represent company mission operations; the blue areas represent the company's engineering and process engineering capabilities; the yellow areas represent mission capabilities.

Operational View of Mission Support

Let's begin the discussion of the operational view of Mission Support with the mission operations feedback. This contains operational deficiencies and gaps that relate to the operational command, as well as the engineering support. These deficiencies and gaps are addressed in many time frames. The operational command may redirect resources, change the operational tempo and change the quality or preparation of the personnel performing the mission. The engineering command looks to address the deficiencies by identifying changes in the processes to perform the mission, the organization of the people and equipment, and changes in the processes to sustain the equipment and people performing the mission.

One longer-term option for the engineering command is to consider the replacement or upgrading of equipment. In these cases, they will provide information and resources to a Mission Systems Integrator (MSI) that will engage in concept development. This

not only includes developing the concept for the mission system, but also building the concept for Mission Support. During concept development, for example, the MSI may assess current maintenance processes, and identify and compare alternative maintenance strategies. These alternatives may be compared by a simulation and analysis to evaluate key measures such as operational availability, impact on footprint, marginal cost and tempo.

The lessons learned may be used to develop a maintenance sub-architecture design statement. For example, during technology development, the MSI conducts research for sensors and algorithms to implement the proposed concept. During the system development and demonstration, the MSI is developing virtual or live simulations of the maintenance concept to validate it and demonstrate its value to the customer. For example, during production and deployment, the maintenance software is integrated into the system software and the training in the new maintenance operational concept is developed.

As a result, a new system or upgraded system is fashioned to enable better Mission Support.

There is another important kind of feedback from mission operations: sustainability feedback. This relates to the operation of the business process that delivers the sustainability services; it occurs during the operations and support phase. The Mission Support provider collects this data to continuously evaluate the Mission Support activity and determine near-term actions.

The scope of this data includes the location and planned destinations of

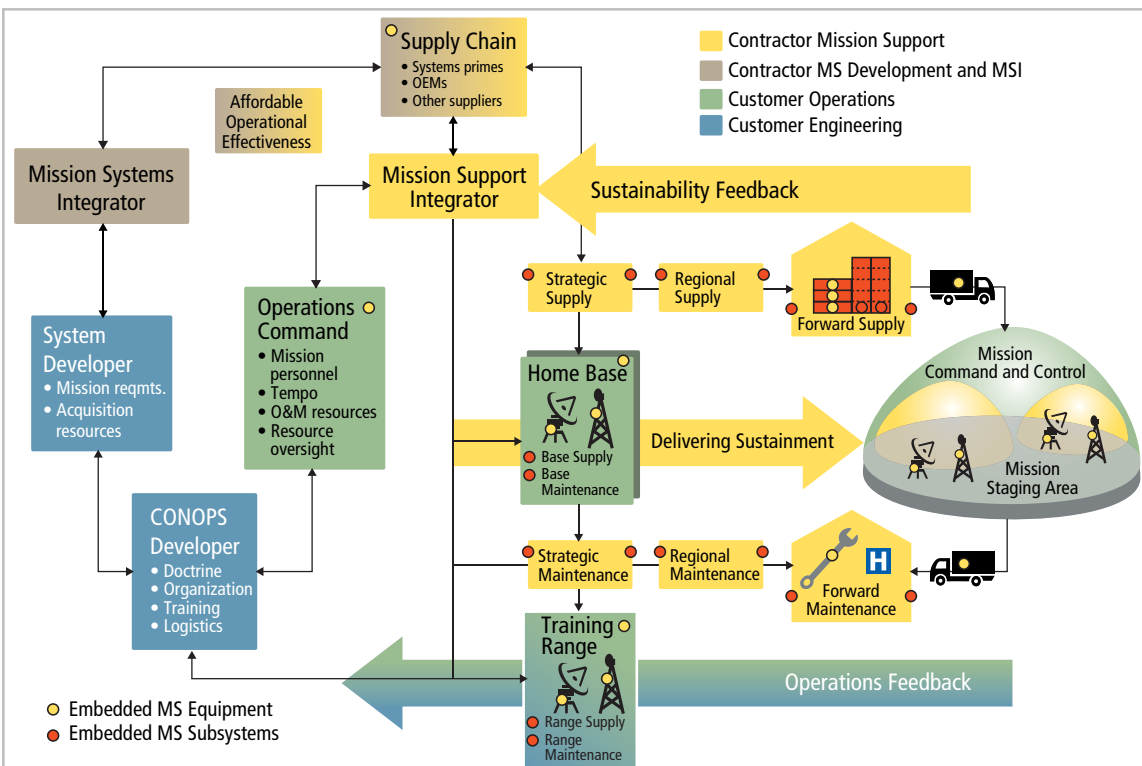


Figure 1. Operational view of Mission Support

material as it moves from the supply chain through various warehousing to be delivered to the customer's operational activities — whether they're in the mission staging area, at home bases or during training. The data also includes the configuration and health of key subsystems, the activities of various levels of maintenance from the user through various levels of repair depots, and the location and future disposition of these systems. Using this data and modeling, simulation and operations analysis, the Mission Support provider is continually refining the business process of delivering Mission Support initialized by the MSI.

The Mission Support provider optimizes operational availability, responsiveness and total ownership cost based on the real experience of the users and the current costs and operational goals.

At each level of operational command, the logistics data is appropriately analyzed, summarized and shared with the operational command so that the current logistics state and near-future alternatives can interact with the operational command decisions in performing the missions. The extent and responsiveness of the logistics options represent agility and flexibility to operational command. Accordingly, the operational management can exercise flexibility in terms of the mix and tempo of the mission and Mission Support activities to respond to mission challenges. These assessments and decisions occur at every level of operational command — and the Raytheon Mission Support system delivers the logistics state and options. The life cycle operational view for Mission Support underscores that the balanced approach between system development and operations and support is key for the customer to achieve affordable operational effectiveness.

Systems View of Mission Support

Mission Support is now a net-enabled activity. There are four major classes of elements that are integrated in order to sense the end-to-end logistics situation and make decisions on appropriate Mission Support actions to undertake, and effectors that deliver logistics services. Figure 2 (page 12) shows the systems view of the Mission Support architecture and how these elements are linked to other key participants in delivering Mission Support services.

Asset Element

The asset element consists of hardware and software embedded in the mission or product within the mission system. It is most efficient to design the original mission system to contain the Mission Support asset element. However, existing systems can be refitted with a mission systems asset element.

The asset element contains sensors that monitor the health and status of critical

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PROFILE



James Westphalen

As focused logistics manager for Network Centric Systems (NCS) Combat Systems, Jim Westphalen represents NCS on the Raytheon Mission Support Council, as well as working groups for focused and performance-based logistics.

Jim spent 10 years on high-volume production programs in Sherman and Lewisville, Texas, working on HARM missiles, Paveway, precision-guided weapons and Harpoon missiles before transferring to the Electronic Warfare (EW) Group at China Lake Naval Weapons Center in California. He served as project manufacturing engineer in the EW group in the late 1980s on the United States EA6B program, as well as the German/Italian ECR Tornado program, producing a new EW system for the Tornado: the Emitter Location System (ELS). Because the German and Italian air forces wanted the

long-term support of the system to be in Europe rather than the U.S., Jim was tasked to design, bid and manage the proposal for a European ELS depot. He moved to Germany to coordinate the building of the depot.

After returning from Germany, Jim worked with the Electro-Optics business unit in McKinney, Texas, where he began research into depot privatization and product support approximately eight years ago. With the Department of Defense (DoD) contemplating outsourcing much of its work to industry at that time, Jim prepared a business case to validate the market, pursuing it as a source of revenue.

Jim and his colleagues in Combat Systems created the first model contractor logistics support program for the TOW Improved Target Acquisition System (ITAS) in 2000. It was a five-year, performance guarantee contract for full support of the ITAS system; it was also chosen as one of the DoD's top-10 pilot programs for performance-based logistics.

Jim is most passionate about the creativity that's needed to generate tailored solutions for his customers. The end goal for each solution, though, is always the same: Make products that work right, every time. As a former marine, Jim can relate closely to this necessity. Jim and his team know that in order to ensure mission success, their systems must perform whenever the soldier, marine, sailor or air crew needs them to work.

The best advice he can give a new engineer is to think from the customer's perspective. "Put yourself in their shoes and imagine what it's like to depend on our systems and services," he said. "What would you want them to do and what kind of support would you seek?"

Continued from page 11

subsystems. These measurements can be made available in real time to the system operators via the asset operating system, just like the gauges in an airplane. These measurements may also be used to diagnose failures within the system or to efficiently predict the approximate time to future failures. So, the mission system can minimize operational disruption by scheduling maintenance when it is needed and when it is convenient. This is useful to the operational command because it speaks to the reliability of the asset for near-term missions. This element autonomously communicates its logistics needs consistent with the logistics and communications doctrines established by the operational command.

The asset element participates in an awareness of where it is at all times and it tracks its configurations “as-built,”

exercises where some of the external environment is virtual (e.g., fire effects) and some is live (e.g., command and communications).

Command Aggregation and Analysis Element

The command aggregation and analysis element supports the operational command by collecting logistics and system status from all of the elements under its command. This information is analyzed and summarized for the operational command so that operational and Mission Support decisions synergize to enhance operational effectiveness.

The command aggregation and analysis element tracks the status and location of all of the supply elements currently designated for that command. It tracks the location and status of all items undergoing repair and computes the response time to the logistics needs of the unit.

supply items and pallets of items and adds the current location to the record of the item.

The status, schedule and performance of depot maintenance assets are tracked with the asset management model. The location and status of mission systems or products are tracked while they are under repair.

The asset management element keeps track of all of the items as they are transshipped, and also tracks the status, schedule, performance and location of the transshipment assets. Depending on the importance of the item, the name of the transshipment vehicle, the item’s location in the vehicle, and the location of the vehicle all may become part of the item’s record.

The asset management element participates in the tracking of the performance of facilities that perform supply warehousing, depot repair and item transshipment.

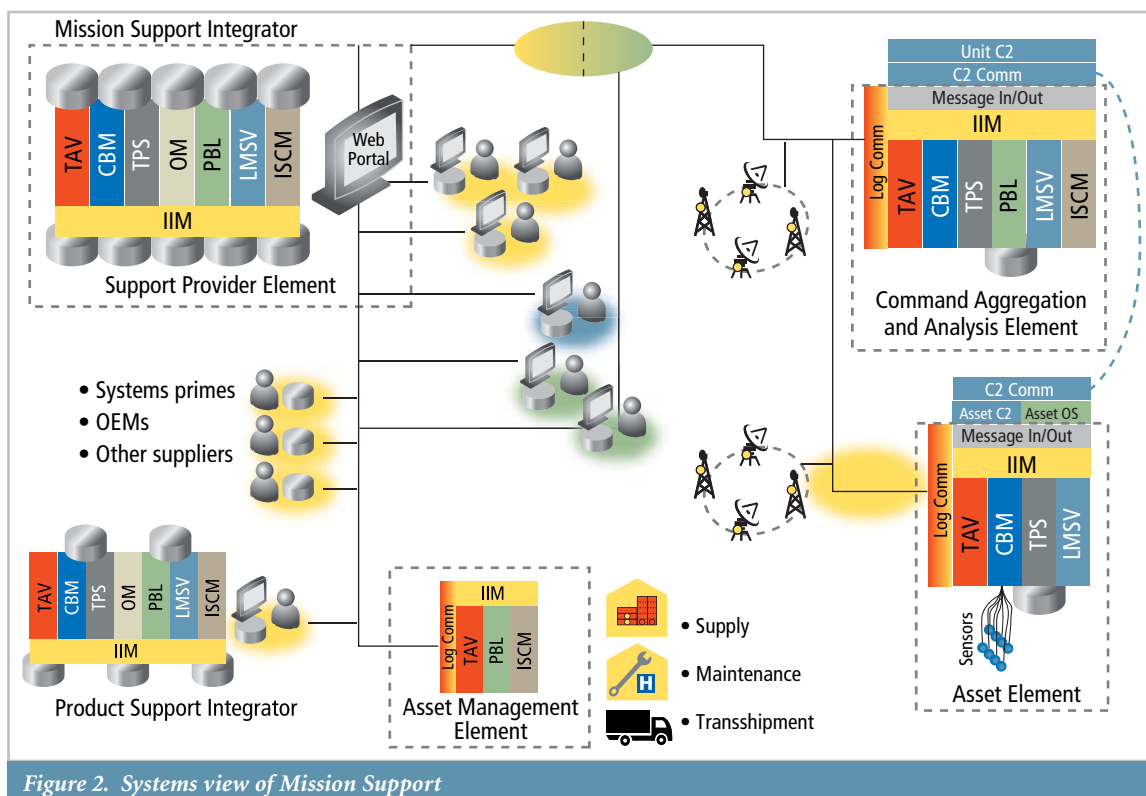


Figure 2. Systems view of Mission Support

“as-maintained,” and “as-is.” It may carry media on how to perform repairs that can be performed while deployed in the field. The list of spare parts, tools and consumables is also useful for sharing and optimizing operational availability in the field without outside assistance.

The asset element is also a platform for operational training. Such operational training might involve mission rehearsal or other

The command aggregation and analysis element is also a platform for operational training. It may support the participation of the command element or it may evaluate the participation of units under the command element.

Asset Management Element

The asset management element keeps track of all of the items delivered from suppliers into the logistics systems. It recognizes individual

Support Provider Element

The support provider element produces a comprehensive, customer-oriented and Mission Support management-oriented information repository and portal for insight and oversight of Mission Support operations. Customer visibility into the oversight of the Mission Support operation enables rapid and informed feedback on priorities. It also engenders confidence that customer needs are being served; it is a component of Mission Assurance for Mission Support.

The support provider element tracks the current state and direction of the entire support system. It derives summary data that assesses the quality of service to the customer in terms of the customer’s performance support metrics.

Managers use the integrated information management system to assess the ability of the supply chain to continue its support with material and technical data. Analysts use the data to assess the capability of the system to continue its support. They also compare alternative options to improve service, optimizing the required performance support per cost data and the analysis to extract. ●

Jay Gould
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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>

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