START
Selected Topics in Assurance Related Technologies
Volume 7 Number 2

Flexible Sustainment

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Introduction

Readiness is the ability of forces or equipment to deliver designed outputs without unacceptable delay. While "readiness" is associated more with combat forces, it can also be used to describe how well an enterprise is poised to impact or respond to commercial marketplaces. The term comprises human resources and equipment (weapons systems, e. g.) among its many elements. *Affordable* readiness is that level of readiness that can be sustained within some budget or at minimum life-cycle cost. The discussion here is about the support necessary to keep a system ready (a contribution to overall readiness) at an affordable cost. Affordable readiness encompasses four separate but related ways to look at support for weapons systems:

- Total Cost of Ownership
- Sustained Maintenance Planning
- Flexible Sustainment
- Rightsourcing

That is, total cost of ownership, or life-cycle cost, cannot be minimized unless:

- maintenance planning is continually reviewed for system optimization (sustained planning);
- performance-based specifications and metrics are used to adjust existing support concepts and operations; and,
- innovative procurement strategies are employed to find the best sources of supply, labor, and materials to support the system.

This START sheet addresses the concept of Flexible Sustainment (FS). (The RAC has also published a closely related separate sheet on Sustained Maintenance Planning.)

Background and Concept

Sustainment is all the activities required of an Integrated Weapon System Management (IWSM) single manager in support of operating command customers, to keep a weapon system operational in both peacetime and wartime. Innovative sustainment is required to extend the useful lifetimes of all systems in a global threat environment that is by no means static.

With the reduction of DoD budgets in the 1990s, there has been a procurement lull in new systems acquisitions, forcing greater reliance on aging platforms to sustain defense capability. These legacy systems must now be extended far past their original planned life cycle. The challenge is how to sustain—including force modernization— systems in an increasingly tighter budget environment, and in a very dynamic global business environment.

As an acquisition reform initiative responding to the Secretary of Defense's 29 June 1994 memo, Specifications and Standards - A New Way of Doing Business, the Commander of the Air Force Materiel Command chartered the Non Governmental Standards Integrated Program Team (NGS-IPT). Flexible Sustainment is one of seven principal areas that the NGS-IPT focused on and then transitioned to the Joint Aeronautical Commanders' Group (JACG) for further consideration, development, and implementation. The JACG referred the FS task to the Aviation Logistics Board (ALB), which spun off a Flexible Sustainment Sub-Group. These bodies evolved and bundled the ideas of innovatively and cost-effectively doing "whatever it takes" to keep weapons systems operational into the concept called Flexible Sustainment.

More specifically, Flexible Sustainment:

- is a decision point driven process to implement acquisition reform in an orderly manner;
- is a process that *demands* the optimization of investment strategies for support;
- introduces Reliability-Based Logistics (RBL) and Trigger-Based Asset Management (TBAM) as constituent sub-processes; and
- encourages other innovative support strategies such as NDI and COTS procurements, Form-Fit-Function-Interface (F^3I) and open-systems integration, performance warranties applications, and obsolescence assessment.

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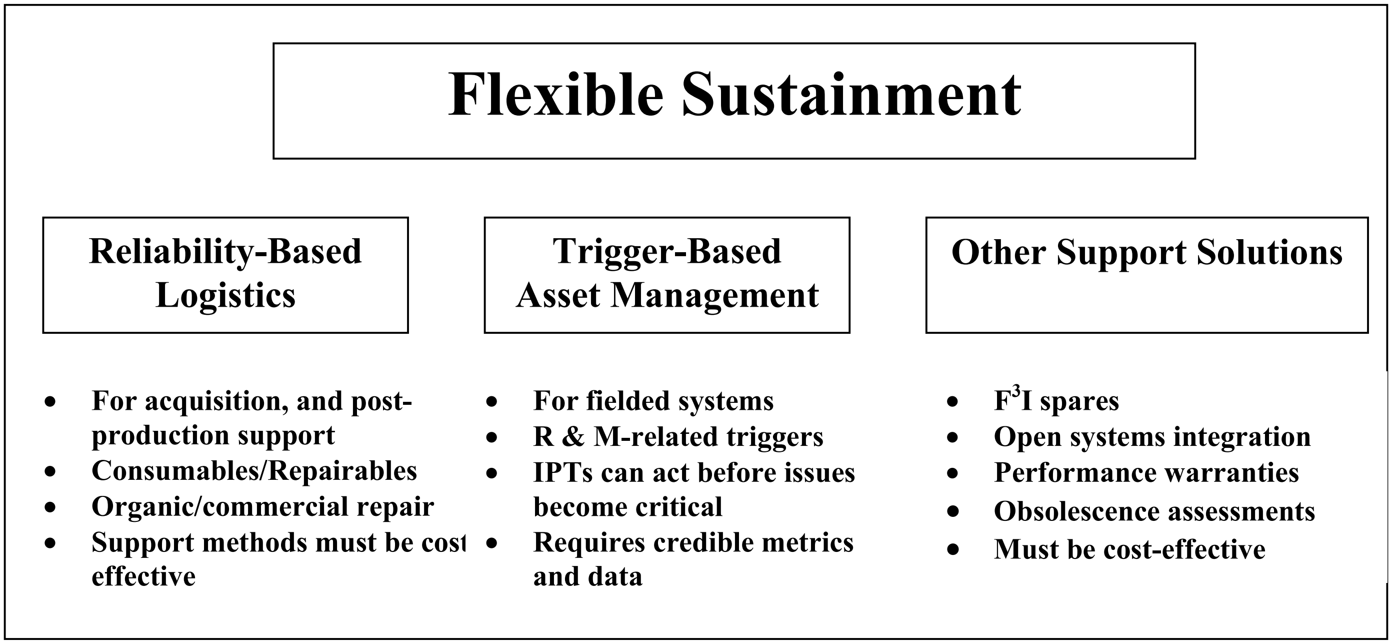

Figure 1. Components of Flexible Sustainment

FS Components

During its first meeting in November 1995, the Flexible Sustainment Sub-Group decided to produce a "DoD Flexible Sustainment Guide." The guide identifies and introduces two "new reliability-based processes" as Reliability-Based Logistics (RBL) and Trigger-Based Asset Management (TBAM). These processes are acknowledged to be compilations of techniques and methodologies in use by DoD and industry organizations. RBL and TBAM recommend *maximum consideration of commercial organic industrial capabilities* to obtain the most cost-effective support solutions. A third FS component is labeled "Other Support Solutions," an umbrella term for *any* other innovative support solutions that reduce system life-cycle costs. Figure 1 shows these three components with examples of what they comprise.

Reliability-Based Logistics is a process that recognizes the importance of designing reliability into systems in order to reduce the fielded maintenance support infrastructure. Specifically, RBL:

- increases inherent system reliability, reduces the maintenance support structure, and develops the best "design for support" solution;
- examines whether items should be consumable or repairable; and
- includes source of repair (SOR) analyses to decide on commercial and / or organic sources.

Trigger-Based Asset Management is a proactive approach to "support the design." TBAM assesses the performance of fielded systems and re-examines the support structure when "triggers" (such as a change in reliability or maintainability, change in technology, or diminishing sources) are detected. The triggers enable IPTs to take appropriate action before a support issue becomes critical. *The key to successful TBAM is a commitment to apply the significant resources that may be required to collect and analyze performance data.*

Other Support Solutions includes any cost-effective techniques, especially ones that recognize DoD's "customer" (vs. "driver") status in the overall marketplace. Ideally, DoD can adapt solutions to its environment, and avoid redundant investments that would be necessary to re-invent the same or similar solutions. Specific techniques in this FS component include F^{3}I spares acquisitions, and maximizing the benefits available by moving toward "open systems" solutions whenever possible.

Properly structured performance warranties, stand-alone or integrated with CLS (Contractor Logistics Support), can be an effective support solution. A key here is that customers *must expect* to compensate suppliers for their additional risk, while staying within an overall cost-effective solution space.

NDI (Non-Developmental Item) and COTS (Commercial Off-The-Shelf) procurements are examples of additional acquisition techniques that can be used to enhance sustainment and minimize life-cycle cost.

Again, *a key to many of these "other support solutions" (e. g., warranties) is a commitment to apply the significant resources that may be required to collect and analyze performance data.*

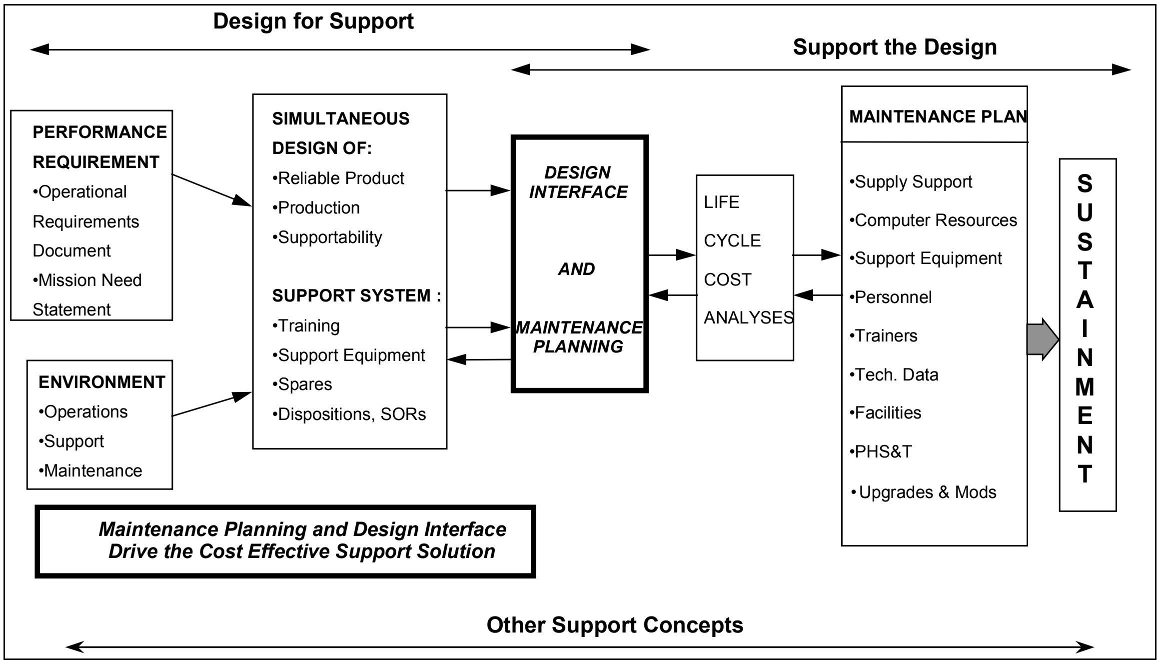

Figure 2. Planning the Support Process for Sustainment

Implementing FS

Figure 2 is adapted from Figure 1 in Section 2 of the JACG Flexible Sustainment Guide. The figure shows the conceptual relationship between "Design for Support," associated with Reliability-Based Logistics, and "Support the Design," associated with Trigger-Based Asset Management. "Other Support Concepts" underlies and integrates with those FS processes to achieve sustainment. It is the application of innovative solutions—including (perhaps especially) those adapted from the private commercial and industrial sectors—throughout the support planning process that defines the concept of **Flexible Sustainment.**

For Further Study

Web Sites. Additional information on FS can be obtained from the following web sites. In addition, many of the publications in the list that follows can be downloaded from these sites. The first listed publication is the source for most of this sheet.

a. http://deskbook.osd.mil/deskbook.html

b. http://www.wpafb.af.mil/az/jacg/logistic/fs-guide/flexsust.htm

c. http://www.nalda.navy.mil/3.2/rcm/

d. http://www.acq-ref.navy.mil/

Publications

a. Joint Aeronautical Commanders' Group. Flexible Sustainment Guide, Change 2. December, 1998.

b. Naval Air Systems Command. Draft NAVAIR 00-25-406, Management Manual, Design Interface Maintenance Planning. Washington, D. C.: Commander, NAVAIR, January, 1999.

c. Naval Air Systems Command. Maintenance Trade Cost Guidebook. Washington, D. C.: Cost Department, NAVAIR-4.2, October, 1998.

d. Naval Air Systems Command. Joint Service Guide for Post Production Support Planning. Patuxent River, MD: Logistics Policy and Processes, AIR-3.6.1.1, October, 1997.

e. Naval Air Systems Command. NAVAIR 00-25-403, Management Manual, Guidelines for the Naval Aviation Reliability-Centered Maintenance Process. Washington, D. C.: Commander, NAVAIR, October, 1966.

f. Naval Air Systems Command. Contracting for Supportability Guide. Patuxent River, MD: Logistics Policy and Processes, AIR-3.6.1.1, October, 1997

Other START Sheets Available:

RAC's Selected Topics in Assurance Related Technologies (START) sheets are intended to get you started in knowledge of a particular subject of immediate interest in reliability, maintainability and quality.

94-1 ISO 9000

95-1 Plastic Encapsulated Microcircuits

95-2 Parts Management Plan

96-1 Creating Robust Designs

96-2 Impacts on Reliability of Recent Changes in DoD Acquisition Reform Policies

96-3 Reliability on the World Wide Web

97-1 Quality Function Deployment

97-2 Reliability Prediction

97-3 Reliability Design for Affordability

98-1 Information Analysis Centers

98-2 Cost as an Independent Variable

98-3 Applying Software Reliability Engineering (SRE) to Build Reliable Software

98-4 Commercial Off-the-Shelf Equipment and Non-Development Items

99-1 Single Process Initiative

99-2 Performance Based Requirements (PBRs)

99-3 Reliability Growth

99-4 Accelerated Testing

00-1 Sustained Maintenance Planning

These START sheets are available on-line in their entirety at http://rac.iitri.org/DATA/START.

About the Author

Stephen G. Dizek is a Senior Engineer with IIT Research Institute, where he has worked on projects related to Reliability, Cost-Benefits Analysis, and Decision Support. Before joining IITRI, he worked in industry as Reliability and Sustaining Engineering Manager for design, build, and fielding of precision, automated, robot-based materials handling systems. Earlier, he spent 15 years with Dynamics Research Corporation (DRC) and The Analytic Sciences Corporation (TASC) as Manager and Technical Director for weapons systems projects on reliability, warranty, logistics, risk analysis, decision support, and the development and implementation of sequential Bayesian techniques for assessing dormant systems. Prior to that, a 22-year United States Air Force career included acquisition assignments to Electronic Systems Division, the MINUTEMAN SPO at the Space and Missile Systems Organization, and Aeronautical Systems Division.

Mr. Dizek holds a BS in Mathematics (minor in Mechanical Engineering) from the University of Massachusetts, an MS in Systems Engineering (Reliability) from the Air Force Institute of Technology (AFIT), and an MS from the University of Southern California in Systems Management. He is a resident graduate of the United States Naval War College's School of Naval Command and Staff, and earned graduate-level certificates from AFIT in Systems Software Engineering and Systems Software Acquisition. He has presented papers to numerous RAMS, SOLE, NAECON, and NES / ICA symposia, workshops, and chapter meetings, and guest-lectured at AFIT, DSMC, and TASC.

About the Reliability Analysis Center

The Reliability Analysis Center is a Department of Defense Information Analysis Center (IAC). RAC serves as a government and industry focal point for efforts to improve the reliability, maintainability, supportability and quality of manufactured components and systems. To this end, RAC collects, analyzes, archives in computerized databases, and publishes data concerning the quality and reliability of equipments and systems, as well as the microcircuit, discrete semiconductor, and electromechanical and mechanical components that constitute them. RAC also evaluates and publishes information on engineering techniques and methods. Information is distributed through data compilations, application guides, data products and programs on computer media, public and private training courses, and consulting services. Located in Rome, NY, the Reliability Analysis Center is sponsored by the Defense Technical Information Center (DTIC). Since its inception in 1968, the RAC has been operated by IIT Research Institute (IITRI). Technical management of the RAC is provided by the U.S. Air Force's Research Laboratory Information Directorate (formerly Rome Laboratory).