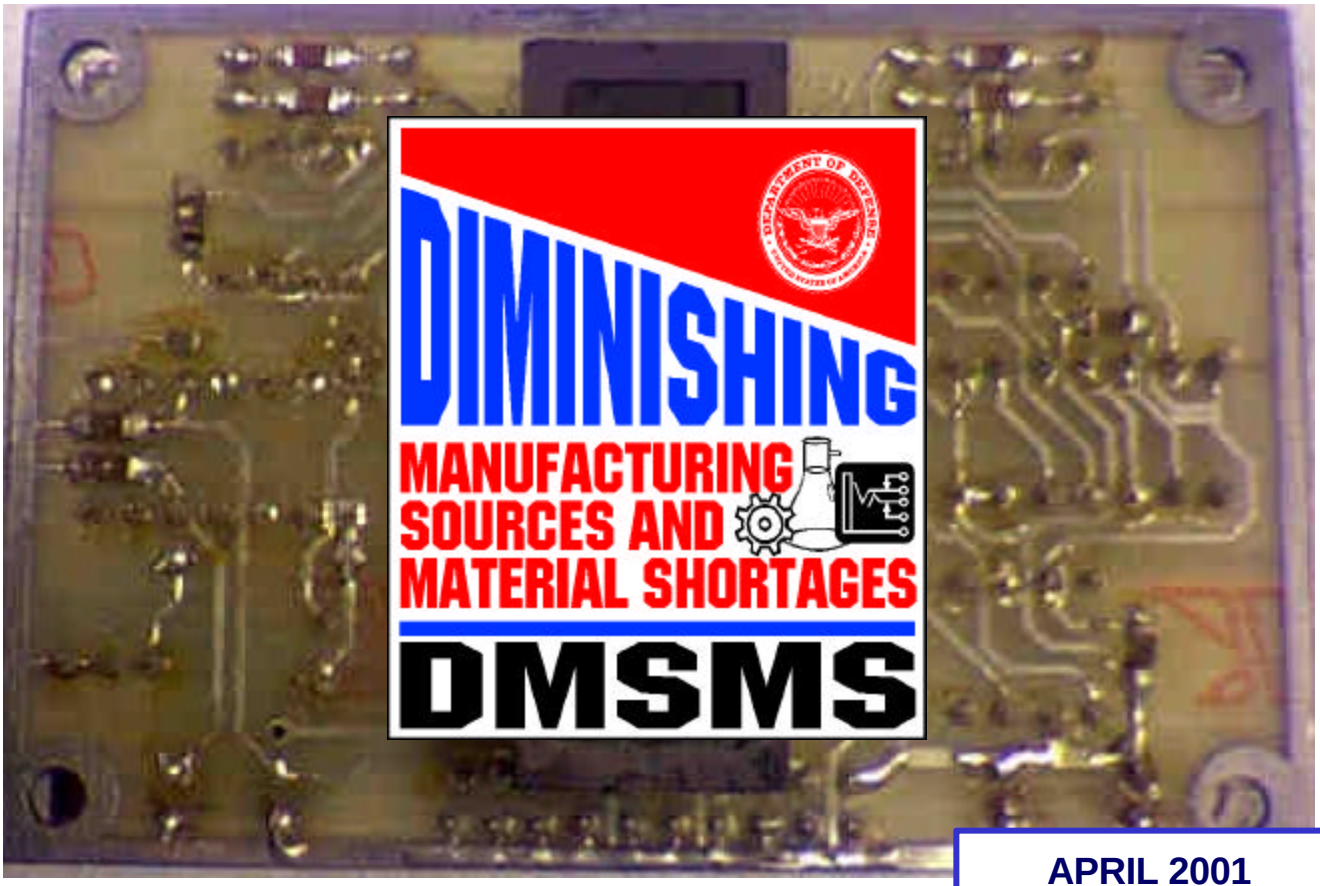
Collaborative Opportunities in DMSMS



APRIL 2001

STUDY REPORT

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NORTH AMERICAN TECHNOLOGY AND INDUSTRIAL BASE ORGANIZATION

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Mr. Don Jergens	Integrated Information Technology Corp.
Mr. James Neely	U.S. Air Force Research Laboratory
Mr. Kevin Rankin	Defense Microelectronics Activity
Mr. Ron Shimazu	Defense Microelectronics Activity
Mr. Alan Taylor	U.S. Air Force Research Laboratory
LtCol Sandra Tilley	Canadian Forces Logistics Liaison Unit

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Executive Summary

I. Sponsoring Organization

The North American Technology and Industrial Base Organization (NATIBO) is chartered to promote a cost-effective, healthy technology and industrial base that is responsive to the national security and economic progress of the United States and Canada. Current policy calls for national defense forces that derives their strength and technological superiority from a unified commercial and military industrial base. The NATIBO charter is to:

- Promote the development, administration, communication, and execution of the U.S. Department of Defense (DoD) and Canadian Department of National Defence (DND) technology and industrial base programs and policies.
- Foster cooperation between the Governments of the United States and Canada in development of coordinated technology and industrial base policies and programs, including policies and programs that promote the integration of the defense and commercial industries.
- Leverage resources through cost sharing and economies of scale afforded through coordinated studies and projects involving research, development, industrial capability, and logistics programs.
- Promote the interchange of technology and industrial base data between Canada and the U.S., the military services, other government agencies, and industry.
- Promote coordination of technology and industrial base planning and insertion programs undertaken by the responsible U.S. and Canadian departments and agencies in support of their national security responsibilities.
- Ensure that North American technology and industrial base considerations are taken into account during U.S. or Canadian military and/or civilian emergency planning activities.
- Enhance the national security of both nations by promoting the competitiveness of the North American technology and industrial base.
- In performing the above, raise issues with relevant bilateral committees in those cases where interface between the NATIBO and these committees is determined to be advisable.

The NATIBO organization is co-chaired by the Director, Office of Technology Transition, for the U.S. and the Director General International and Industry Programs, for Canada. U.S. members represent the Office of Secretary of Defense, U.S. Army, U.S. Navy, U.S. Air Force, U.S. Marines, Defense Logistics Agency, Defense Contract Management Command, and the Office of Joint Chiefs of Staff. Canadian representation is from the Department of National Defence and Public Works and Government Services Canada. These representatives form the Steering Group and provide strategic direction, approve projects, review the progress of the Organization, and act as a conduit for addressing recommendations to U.S. and Canadian authorities. There are four nonvoting, observers on the NATIBO Steering Group. These observers are the U.S. Federal Emergency Management Agency, U.S. Department of Commerce, Industry Canada, and Canadian Commercial Corporation.

II. Purpose and Scope of the Project

In August of 2000, the NATIBO Technology Base Enhancement Working Group initiated a six month study on Diminishing Manufacturing Sources and Material Shortages (DMSMS). DMSMS is defined as the loss or possible loss of manufacturers or suppliers of items including shortages of raw materials. DMSMS is driven by both technology and market conditions. Technology turnover has been highest in electronics, but also includes materials, chemicals, and mechanical parts. The Government Industry Data Exchange Program (GIDEP) processes approximately 66,000 electronic part obsolescence alert notices annually, as compared to approximately 2700 mechanical part notices. Because of that impact, this study concentrated upon electronics DMSMS problems and the business practices in place to manage them.

The study avoided duplicating areas evaluated as part of recent DoD DMSMS studies and focused on joint U.S. and Canadian opportunities. Technical direction from the DoD DMS Working Group, which included the Defense Microelectronics Activity (DMEA), GIDEP, Defense Supply Center Columbus (DSCC), and the U.S. Service Activities, was provided. Current and past DMSMS policies, regulations, guides and manuals, and practices, both military and commercial were reviewed. In order to better understand current and planned DMSMS practices, 27 site visits were undertaken (details of each are documented in Appendix A). The site visit team consisted of members of the U.S. Air Force (USAF) Industrial Base Program Office, DMEA, and various DND representatives that included the NATIBO POC from National Defence Headquarters, Canadian Forces (CF) Liaison Officers, a Canadian Embassy Staff Officer and CF Logistics Liaison staff personnel. The selection of sites to document was based upon their appropriateness to joint collaborative follow-on activities. Sites in both the U.S. and Canada representing Service DMSMS functional support offices, weapon system sustaining engineering organizations (government and industry), and national facilities were included in the itinerary.

III. Findings and Analyses

DMSMS is a problem for both DoD and DND. According to the Electronics Industry Association, global marketplace considerations have changed dramatically over the past 25 years. In 1975, government and commercial aerospace electronics represented 17% of the total $4.2B worldwide electronics market; with technology turnover every 15 – 20 years. In 2000, aerospace electronics represented only 0.4% of the $150B global marketplace. Consumer, commercial, and industrial electronics now drive the market. These new market forces are causing technology turnover every 12 – 24 months, at a time when military legacy system service lives are being extended to 40+ years.

DMSMS and obsolete parts are not a new phenomenon. DoD and DND have been using the GIDEP since the mid-1960s for obsolete parts alert notices. The DSCC, formerly the Defense Electronics Supply Center, DESC, has been tracking obsolete parts since the 1970s. What is new about DMSMS is the recent recognition of the enormity of the problem and its impact on operational readiness. Most of the current DMSMS efforts to

improve management practices by applying dedicated resources have only been underway since the mid-1990s.

Since the mid-1990s, a host of DoD initiatives have significantly influenced the development of many of the DMSMS practices now in place. Acquisition Reform policies, regulations, and directives dramatically changed both the logistics and procurement communities. Driven by the reality of reduced defense budgets and a consolidated military equipment supplier base, the new operating premise is that the military user, the logistics provider, and the system supplier are all "stakeholders" in the entire life cycle of a military weapon system. In selected newer systems, the logistics provider is a contractor who may have overall system performance and configuration responsibility. All of this has resulted in changes in the way in which both government and industry view the DMSMS issue.

Traditionally, DSCC and the various DoD Service Activities took a predominately reactive approach to DMSMS; they responded only to specific alert events, and early DMSMS practices focused upon one-for-one component replacement. Of note, the DND Common Equipment Program Manager (EPM) Office uses reactive Life-of-Type (LOT) buys as their primary resolution method. In the U.S., as the number of alerts has grown, a proactive approach was needed in order to maintain system operational availability and mission readiness. Table 1 highlights some of the differences between a reactive and proactive DMSMS management approach.

Table 1: Comparison of Reactive vs. Proactive DMSMS Management

	Reactive DMSMS Management	**Proactive DMSMS Management**
Characteristic / Requirement	Event Driven (DMSMS Alert)	Requires Up-Front Investment and Planning
		-- Sustained Engineering Resources
		-- Technology/Business Forecasting Tools
		-- Budgeting for Modifications and Upgrades
	Accurate and Timely Information	Accurate and Timely Information
Impact	Increased Risk of Impact on Mission Readiness	Improves Mission Readiness
	Cost and Maintainability Impacts Compound as system ages	Facilitates Enhancements to System Capabilities

While DMSMS costs are rarely broken out separately, the USAF B-2 SPO conducted a Business Case Analysis in 1997 of the impact of reactive versus proactive DMSMS practices on that system. That analysis concluded that, on average, proactive measures offered a significantly greater return on the investment.

The Services have adopted a common structured approach to DMSMS management. This approach consists of four iterative steps: Identification/Notification, Verification, Options Analysis, and Resolution/Implementation.

Identification/Notification involves receipt and dissemination of an alert notice from DSCC, GIDEP, part suppliers, or from a Service Activity when it receives a "No Bid" on a part solicitation. For reactive DMSMS response practices, this is the event that triggers the next three sequential steps. For proactive DMSMS response practices, this will confirm forecasted obsolescence problems. Several trends were noted within current practices:

- Increased use of DMSMS support organizations (government and contractor) to pre-filter the massive broadcast part data against indentured parts lists applicable to subscriber weapon systems.
- Improved communications with the semiconductor industry resulting in more accurate and timely part information.
- Expanded use of Internet and E-Commerce links to rapidly disseminate part information.
- Increased reliance on commercial part information. For example, the composition of GIDEP alerts has changed from 20% commercial parts (versus 80% military specification parts) in Fiscal Year (FY) 1998 to 70% commercial parts in FY2000.

The Verification step begins when the pre-filtered part alerts are received. During this process, operators correlate part data to weapon system impacts. For example, if a departing part supplier offers a LOT buy for a high reliability part that already has a low usage rate and a 55 year inventory, the alert does not result in a DMSMS case. The following trends were noted for current practices:

- Individual program office and shared sustaining engineering organizations are using common information systems to evaluate multiple weapon system impacts, available inventories and shared resolutions. This includes the synergistic application of commercial and in-house databases and analytical tools.
- Operators are beginning to look beyond one-for-one component replacement point solutions. Cases are being highlighted for system engineering review and possible technology insertion.
- Several analytical tools are incorporating component "health" predictions that allow initial decisions on whether the final resolution will be a logistic or an engineering solution.

Options Analysis follows the initial logistic versus engineering decision. This step is the most intensive of the processes. The Naval Surface Warfare Center, Port Hueneme, California, estimated that 80% of their non-recurring engineering expenses occurred during this step. The goal of this process is to select the most cost-effective solution that supports system mission readiness needs. To arrive at the optimum solution, the decision process may require information that considers weapon system mission importance, operating and support costs, system reliability, availability, and maintainability. This is in addition to normal repair and logistics concerns.

Key factors that influenced DoD's and DND's selection of DMSMS practices during the Options Analysis process included overall differences in force structure, maintenance/ logistics systems, and operational strategies. While the U.S. and Canada are using similar reactive practices for legacy systems, the number and variety of systems in the U.S. has accelerated the need for aggressive DMSMS management. There also is a difference between the U.S. and Canada in the number and scope of new weapon systems being developed. Both countries are modifying maintenance strategies to shift a greater portion of life-cycle management and responsibility to their respective defense industries. For example, Boeing is responsible to the USAF for C-17 total aircraft system and logistics performance. Boeing has subcontracted Warner Robins Air Logistics Center (WR/ALC) and Oklahoma City Air Logistics Center (OC/ALC), both government facilities, for repair of C-17 systems. Other trends noted include:

- The use of Business Case Analysis, Technology Forecasting, Operational Reliability/ Availability/Maintainability tools are beginning to be used by many legacy system managers in lieu of standard reactive practices.
- In addition to mission readiness metrics, economic (size of fleet, operating and support costs, program funding, planned system retirement), performance growth and limitations, and life cycle (development, production, fielded) factors are being considered.
- Program Offices are beginning to dedicate resources, either financial or personnel, to actively manage DMSMS and parts obsolescence. On fielded systems this represents a subset of the sustaining engineering function. On systems in development it becomes part of the iterative design and test activity.

The Resolution/Implementation step follows the decision for an applicable DMSMS response from the Options Analysis process. Not many DMSMS resolution metrics have been published to date. Most of the statistics reported are from individual studies conducted by government agencies or interested contractors. Two categories that have gone through peer review are business case cost comparison between reactive and proactive practices and empirical resolution results. Reactive responses are less expensive initially, but tend to become more expensive over time as the number of DMSMS part alert notices increase. As a corollary, proactive responses tend to be more expensive initially, but tend to be less expensive over time after the initial non-recurring engineering is expended. Empirical historical data has shown that LOT buys occurs for only 20% of the resolutions; with part replacement occurring 67%, bridge buy/part or unit redesign occurring 12%, and part emulation occurring 1%.

There were a number of Resolution/Implementation trends noted during the site visits. These trends were observed in both countries, but were more prevalent in the U.S.

- Weapon systems service lives are being extended beyond previous LOT buys, and the need for planned/funded upgrades is increasing.
- Sustainment strategies are changing from all organic to combinations of organic and contractor support. The older legacy systems most frequently tend to be maintained organically, while long-term contractor support is used by newer systems.
- Form, Fit, Function Interface (F^3I) designs and redesigns are becoming more commonly accepted. F^3I is being applied to electronics components, circuit card

assemblies, and even whole systems. VHSIC (Very High Speed Integrated Circuit) Hardware Design Language (VHDL) is being used to capture hardware design functionality in software so that newer electronics technology can be inserted in a sequential cycle as it changes. F^3I is being applied to whole systems by replacing military specifications (mil-spec) line replaceable units or total systems with commercial-off-the-shelf (COTS) units.

- Collaborative ventures with after-market suppliers allow some mil-spec parts usage to be retained.
- Collaborative ventures with organic and privatized repair and overhaul facilities provide low volume mil-spec replacement parts and assemblies.

In both the U.S. and Canada, awareness of the risks associated with DMSMS and part obsolescence has increased. The most noticeable trend during the site visits was the increased recognition for greater inter-service, and even intra-service, coordination of DMSMS practices. DMSMS support organizations both within DoD and the Service procurement commands have developed and disseminated a wide array of tools and services to an increasing number of subscriber Program Offices. As a result, Weapon System Program Managers are better equipped to manage the potential impacts.

IV. Recommendations

During the recent site visits, potential areas for collaborative projects were identified and discussed. These opportunities involve leveraging existing DMSMS management practices employed on military systems by either government or industry. Several of the recommendations provide an opportunity to leverage ongoing, funded programs within DoD.

Near Term System Opportunities

NAVSUP ALQ-126B SRU Redesign Project
Under a previous project, Naval Supply Systems Command (NAVSUP) teamed with the DMEA to analyze the ALQ-126B Electronic Warfare system for possible redesign of circuit card assemblies (CCA's) and selected microcircuits. Forty-one unique CCA's and 199 unique microcircuits were identified as possible candidates for redesign using NAVSUP's Rapid Re-Targeting (RRT) tool. As part of that earlier project, 43 microcircuits were RRT modeled, but not fabricated. In the current project, a single UniModule now replaces eight different CCA's. The ALQ-126B is used on a number of U.S. Navy aircraft, as well as on the Canadian Forces CF-18.

Recommendation - Per NAVSUP's suggestion, DND should investigate the possibility of a joint project to evaluate the same or other CF-18 ALQ-126B CCA's as potential RRT redesign candidates.

Point-of-Contact - James Fitzgibbon, NAVSUP, (717) 605-1300, James_E_ Fitzgibbon@navsup.navy.mil.

CECOM ADY-1/PRC-112 Modernization Project
The PRC-112 Air Crew Survival Radio contains modules that are no longer being produced (the Original Equipment Manufacturer (OEM) is Motorola). The unavailability of these modules has led to a shortage of survival radios. The U.S. Army Communications and Electronics Command (CECOM) is in the process of contracting for modernization/improvement of the PRC-112 radio. The PRC-112 is the ground base part of the Personnel Locator System AN/AYD-1. Other units are the airborne base ARS-6 (V), program loader KY-913, and test set TS-4360-AYD-1. The AYD-1/PRC-112 is used on a number of U.S. and Canadian aircraft.

Recommendation - DND should review CF PRC-112 requirements to ascertain if similar DMSMS issue exists for which collaborating on new contract may offer solution. The PRC-112 modernization program may be an opportunity for industry partnering between U.S. primes and Canadian suppliers. In addition, CECOM intends to modernize the other AYD-1 units in the near future.

Points-of-Contact
- Kenneth Brockel, Chief of the Airborne Mission Division, CECOM, for engineering and management issues, (732) 532-2394.
- Kathleen Rizzo, Contracting Officer for the PRC-112 Modernization Program, (732) 532-5798, rizzok@mail1.monmouth.army.mil.

Utilization of Specialized Production Facilities
To broaden awareness of existing capabilities for use by DND Service Activities and/or Canadian contractors, the following facilities for low volume production of military weapon system components, extended invitations for visits (tours and detailed discussions). Information regarding each site's capabilities is available in the site visit reports or via their Internet sites.

Recommendation – DoD and DND ensure broad dissemination of this report to organizations impacted by DMSMS problems, including; sustaining/support engineering offices, supply agencies, government and contractor depot maintenance units, and procurement agencies.

Points-of-Contact
- DMEA, Sacramento, California; Ronald Shimazu, Chief Microelectronics Design and Integration Division, (916) 231-1508, Shimazu@dmea.osd.mil, Web http://www.dmea.osd.mil
- U.S. Army Aviation and Missile Command (AMCOM) Manufacturing Science and Technology Division's Electronics Analysis and Prototyping Facility (EAPF), Huntsville, Alabama; Bob Gibbs, (256) 313-0590, Bob.Gibbs@rdec.redstone.army.mil, Web http://www.redstone.army.mil/mrdec/mst.
- Avionics Production (AVPRO) Division facilities at Warner Robins/ALC Georgia; Michael Doubleday, (478) 926-1423, doubledaym@avionics1.robins.af.mil, Web Site under construction.
- Raytheon Technical Services Company (RTSC), Indianapolis, Indiana; David Devine, (317) 306-3114, devined@indy.raytheon.com, Web Site under construction.

DMSMS Management Information System/Analytical Tool Utilization

NAVAIR Aging Aircraft Program (AAIPT) Obsolescence Analysis

The Naval Aircraft Systems Command's (NAVAIR) Aging Aircraft Program is a cross functional team comprised of engineers and logisticians supporting the Integrated Program Teams with transition of new technology and tools to help counter the effects of age and increased support costs. Led by the Systems Engineering Department (Code Air-4.1D), the AAIPT utilizes several commercial electronic part analysis tools, including Transition Analysis of Component Technology (TACTRAC) from i2 Technologies Inc./TacTech, Parts Plus from Manufacturing Technologies, Inc (MTI), and Free Trade Zone from Parts Minor Company to analyze the various solutions to DMSMS problems. Currently the AAIPT is working with teams from the F-18, S-3, P-3, E-2/C-2 and other legacy weapon systems. These commercial tools perform a number of functions including assessing a real-time library of semiconductors offered by all worldwide manufacturers. Also, they automate indentured configuration management by identifying where components are used within the subject system, and across other subscriber systems. TACTRAC offers obsolescence "Health Model" projection of components, modules, circuit card assemblies, and whole systems. NAVAIR modifies the standard obsolescence process by evaluating reliability problems for a combined solution. The AAIPT is developing a decision support tool to extend the coverage of the TACTRAC and MTI products to select the most cost effective obsolescence solution.

Recommendation - The DND Air Equipment Program Manager (EPM) should evaluate the TACTRAC parts analysis tool for use with its CF-18 program.

Point of Contact - Robert Ernst, Program Head, NAVAIR Aging Aircraft Program, (301) 342-2203, ernstp@navair.navy.mil.

USAF C-130 Indentured DMSMS Resolution Analysis Tool

The USAF C-130 System Program Office (SPO) is using the USAF's Applications, Programs, and Indentures (API) indentured parts system in combination with the commercial Avionics Component Obsolescence Management (AVCOM) data base from MTI to analyze the various solutions to DMSMS problems. AVCOM performs part analysis functions similar to the TACTRAC tool. AVCOM also tracks component availability back to the die (foot print) from which the component is made. Due to the DMSMS problems associated with over 20 different avionics configurations, AVCOM recommended a complete ship-set modernization program. Current upgrades (the C-130J and C-130 Avionics Modernization Program) will result in just two avionics configurations, with primarily commercial avionics installed.

Recommendation - The DND Air EPM should evaluate the new commercial avionics suites, or obtaining the older avionics systems replaced by the upgraded avionics suite.

Point of Contact - Philip Eubanks, Engineering Manager, (478) 926-2853, Philip.Eubanks@robins.af.mil.

USAF Common Avionics DMSMS Resolution Analysis Tool
The USAF Common Avionics Product Directorate manages 614 different Line Replaceable Units (LRU's), some of which are similar to, or identical to, DND systems now managed by the DND Common Avionics EPM. The Common Avionics SPO is in the process of codifying the majority of these 614 systems into the AVCOM part analysis tool.

Recommendation - The DND Common Avionics EPM should evaluate AVCOM for its own use, or to participate in a joint codifying effort to load DND/DoD systems into the indentured database.

Point of Contact - Levern Keels, ILS Manager, (478) 926-7637, Levern.Keels@robins.af.mil.

NAVSEA NSWC Crane DMSMS Resolution Analysis Tool (TORA, TeAM, RAN)
NAVSEA Naval Surface Weapon Center, Crane, Indiana, provides acquisition, engineering, logistics and maintenance for the Fleet's weapon and electronic systems. The DMS and Technology Management Center, working with NAVAIR's privatized depot RTSC and an information technology contractor, System Design Analysis, both in Indianapolis, Indiana, has developed three proactive DMSMS resolution analysis tools:

- Technology Obsolescence Risk Assessment (TORA) identifies near and long term life cycle support problems based upon mission requirements, current system configuration, product supply availability, product survey information, and recommended solutions.
- Technology Assessment and Management (TeAM) performs both a technical feasibility analysis and an economic viability analysis on a target weapon system, LRU, circuit board, or component, in order to determine if equivalent functionality can be achieved using commercial parts or systems. The output of this analysis is a "roadmap" that identifies windows of opportunities for a technology refresh of affected items. Based on this roadmap, solution-scenarios are recommended that are technically and economically feasible as well as concurrent with weapon system objectives.
- Rapid Alert Notification (RAN) is an in-house notification service for subscriber weapon systems. Instead of waiting for randomly occurring part alerts, the DMS Center actively surveys the mil-spec and commercial electronics part marketplace for impending problems. Crane has enhanced the RAN capability to process commercial parts.

Recommendation - Even though DND only has common CF-18 systems that are part of the TORA/TeAM/RAN subscriber list, both DND Air EPM and Maritime EPM should evaluate these tools for possible use.

Point of Contact - Mark Chestnutwood, Chief, Microelectronics Engineering Division, NAVSEA/Crane, (812) 854-2401.

GIDEP/DLA DMSMS Resolution Analysis Tool (Shared Data Warehouse)
The Shared Data Warehouse is being developed by the Government-Industry Data Exchange Program (GIDEP) and the Defense Logistics Agency (DLA), to enable subscriber activities to more effectively manage part obsolescence. The Shared Data Warehouse promotes a systematic, single methodology for processing notices of discontinuance and facilitates a central repository for DMSMS management tools. By applying business process evaluation practices that augment existing diminishing manufacturing sources screening processes, the Shared Data Warehouse provides rapid, economical identification, dissemination, and processing of diminishing manufacturing sources affected part numbers and national stock numbers. The process currently includes database linking, intra-organizational collaboration, business process evaluation practices, and application of advanced information and electronic commerce technologies. By June 2001, the Shared Data Warehouse will encompass data sources within the USAF, U.S. Army, and U.S. Navy repair activities, the DSCC, the Defense Logistic Information Service (Battle Creek, Michigan), and GIDEP Operations Center (Corona, California).

Recommendation - Several of the Services are currently developing modules to interface Service unique DMSMS information systems/analytical tools with the Shared Data Warehouse. As a GIDEP subscriber, DND should evaluate its planned use of the Shared Data Warehouse and any unique interface requirements it may require.

Point of Contact - Robert Bennett, GIDEP Program Director, (909) 273-4677, bennettra@corona.navy.mil.

DMSMS Policy and Communications Interaction

Joint Participation on Selected DMSMS Working Groups
DMSMS problems have been a major source of a noticeable trend toward increasing Operating and Support (O&S) costs and decreasing Mission Readiness/Mission Capable rates for all Service Activities. To emphasize the importance of DMSMS and provide DoD managers with methods and practices to address these problems, a number of groups/organizations have been chartered to coordinate efforts beyond traditional Service boundaries and provide a forum for sharing ideas and partnering on projects.

Recommendation – DoD and DND Service Activities and/or Canadian contractors should evaluate membership to one or more of these groups, or implement periodic meetings with these groups for the purpose of coordinating common initiatives and to discuss possible areas of future collaboration.

Points of Contact

DMSMS Policy	DoD DMSMS Working Group (Overall National DMSMS Policy/ Procedures), Ron Shimazu, DMEA Chief Microelectronics Design and Integration Division, (916) 231-1508, Shimazu@dmea.osd.mil.

DMSMS Technology	DoD DMSMS Teaming Group (Selected DMSMS Tools and Processes), Jerry Martinez, NAVSEA/Port Hueneme (805) 228-8197, martinez_jerry@phdnswc.nswes.navy.mil
VHDL	VHDL International Users Forum, Ron Shimazu, DMEA Chief Microelectronics Design and Integration Division, (916) 231-1508, Shimazu@dmea.osd.mil.
Flexible Sustainment	Joint Aeronautical Commanders Group (JACG), Jerry Beck, NAVAIR, (301) 757-8246, Beckgr@navair.navy.mil

Joint Meetings to Discuss Implications of Performance Based Support Contracts
Performance based support contracts significantly change the government's role and risks in managing DMSMS. Both DND and DoD have experience on fielded and emerging weapon systems.

Recommendation - The feasibility of joint meetings between DoD and DND program managers could be scheduled to discuss management practices, metrics, and lessons learned, at a breakout session of the next DMSMS Conference, first quarter CY2002.

Site Visit Summaries

DoD and DLA

NATIBO / DMSMS Site Visit Report

Organization Defense Microelectronics Activity (DMEA)

Location 4234 54th Street, Building 620, Sacramento, California
(Formerly McClellan AFB)

Point-of-Contact Ron Shimazu, Chief Microelectronics Design and Test Division, (916) 231-1508, shimazu@dmea.osd.mil

Kevin Rankin, Senior Microelectronics Engineer, (916) 231-1644 rankin@dmea.osd.mil

Date Visited 5 October, 2000

Site Mission DMEA is the DoD appointed executive agent for integrated circuit microelectronics DMSMS activities across service weapon system programs. As the lead organization for the DoD DMSMS Working Group, DMEA develops guidelines and strategies which help weapon system program managers effectively manage and mitigate microelectronics obsolescence and related issues.

DMSMS Practices Sophisticated design, testing, and manufacturing facilities support DMEA's 135 engineering specialists. They provide comprehensive microcircuit analysis, reverse engineering, F^3I component, circuit board, and system replacement design, rapid prototyping, parametric testing, complete documentation packages, limited in-house production with larger production by multiple commercial foundries via Advanced Technology Support Program contracts. DMEA's Flexible Foundry assures a continued supply of microcircuits as industry flexes with the market's low volume, on-demand requirements.

DMEA facilities and capabilities discussed during the site visit included:

(1) Their charter charges them to address DMSMS solutions across services and not to concentrate on single point solutions.
(2) DMEA's espousal of F^3I VHDL technologies to solve component, circuit board, and system level redesign efforts.
(3) DMEA's in-house Flexible Foundry can make prototype and limited volume microelectronic parts using equivalent device technology.
(4) DMEA's strong government-industry partnerships via their Advanced Technology Support Program.

DMEA's Flexible Foundry is an innovative approach to supplying military weapon systems with the microcircuits they so desperately need, even though the commercial world has phased out the processes these microcircuits were produced on due to their lack of profitability. DMEA enters into licensing agreements with the commercial process owners whereby DMEA can replicate specific processes in their own clean room, which was specially designed to "flex" from one process to another. With this arrangement, it will be possible for DMEA to produce microcircuits made on these licensed processes for as long as they are needed. Currently, DMEA has licensed the processes listed in the accompanying table. Licensing agreements for several more processes are currently in work, and this list will be added to continuously.

Process	Voltage	Description	Applications
IMP C1004	3-5 V	1m Single Poly Double Metal CMOS	Digital Gate Arrays, 200-38K gates
Raytheon BX1X/BX2X	3-5 V	1.0 / 0.8m Twin Well 2-3 Metal CMOS	Digital ASICS
Raytheon SN	3-5 V	1.2m Silicon Oxide Silicon Nitride CMOS	EEPROM
VLSI	3-5 V	0.6m Silicon Gate 2-3 Metal CMOS	Digital Gate Arrays, 600K gates
Intersil RSG	30 V	3m Power BiMOS	High Voltage Analog, Power Conversion
Intersil EBHF	30 V	3m Complimentary Analog Bipolar	High Voltage Analog
Intersil VHF	16 V	3m Complimentary Analog Bipolar	High Performance Analog
Intersil UHF-1X	10 V	2m Complimentary Analog Bipolar	High Frequency Video Inst, & Comm.
Intersil PASIC II	100 V	2m Complimentary Bipolar & CMOS	Power Control Circuits
Intersil AVLSI	5 V	1.25m CMOS Digital	Digital, Analog, Mixed Signal

An example of DMEA's cross services outreach, as well as their VHDL redesign capabilities and flexible foundry facilities, is a 1996 contract with NATO Maintenance and Supply Agency, in which DMEA reverse engineered a problem circuit board on the Multiple Launch Rocket System (MLRS). Using the VHDL program they generated, DMEA fabricated a F^3I circuit board in-house, and gave that same VHDL program to Holladse Smallpate B.V., United Kingdom's Defense Research Agency, and Hughes ME/Europe. All three organizations used the same VHDL program to fabricate functionally equivalent circuit boards. All circuit boards used different electronics components to implement the

VHDL design. In Luxembourg field tests, all circuit boards worked identically in the MLRS.

Over the past 12 years, DMEA has partnered with many DoD service activities on countless programs, for both deployed systems and R&D efforts, developing redesigned devices, circuit boards, and even LRU's.

DMEA also encourages a proactive approach to the management of DMSMS. To this end, DMEA has developed two documents to help program offices develop and track the success of DMSMS programs. These documents are the *Program Managers Handbook* and the *Resolution Cost Factors for DMSMS.* The *Program Managers Handbook* describes the common practices of DMSMS mitigation that have been implemented with varying degrees of success over the years. It then explains the relative utility and cost of these common practices, and suggests the events and conditions in any program that may warrant the implementation of such a practice. A program office can use this information to custom design a DMSMS program to fit the specific needs of their program. *Resolution Cost Factors for DMSMS* gives recent typical figures for cost avoidance related to the several types of DMSMS resolutions. This information is helpful when determining the value gained in implementing a DMSMS program. Another way to proactively manage DMSMS is through the use of obsolescence tracking tools, which DMEA encourages. While not endorsing one obsolescence tracking tool over another, DMEA has established a contract with i2 Technologies, Inc, that allows program offices to quickly purchase necessary TACTRAC Health Model products and services at a reduced price.

Remarks

In order to make their capabilities known for possible use by DND Service Activities and/or Canadian contractors, for low volume production of military weapon system components, DMEA has extended an invitation for tours either via their internet sites or in person. DMEA's web site can be found at http://www.dmea.osd.mil

NATIBO / DMSMS Site Visit Report

Organization	Defense Logistics Agency (DLA) DMSMS Program Office
Location	Defense Supply Center, Columbus (DSCC), Columbus, Ohio
Point-of-Contact	David Robinson, DMSMS Program Manager, (614) 692-7493, david_robinson@dscc.dla.mil
Date Visited	15 August, 2000
Site Mission	The DLA, with major depots at Columbus, Ohio, Richmond, Virginia, and Philadelphia, Pennsylvania, manages most of the non-core parts for all DoD services; plus providing parts to Foreign Military Sales (FMS) customers. DSCC manages approximately 2.5 million electronics part numbers.
DMSMS Practices	DSCC is one of the military's largest parts notification sources. Many OEM's, Inventory Control Points, etc. report notices to DSCC which analyzes and disseminates them appropriately. DSCC has management responsibility for thousands of parts recently transferred from the U.S. Army, U.S. Navy, and USAF, further increasing the scope of products under their cognizance. DSCC assigns case numbers, performs cursory reviews, identifies National Stock Number (NSN)'s and then issues an alert to the military repair activities that determine future requirements and provide that information back to DSCC. DSCC aggregates the future requirements, reviews submitted information and compares the submitted quantities against on-hand stock and historical part disbursement data. DSCC determines the appropriate strategy (making a LOT buy, identifying substitute stock, requesting engineering assistance, etc.) as needed. DSCC stores and issues components. DSCC provides tools on the web to help OEMs and government agencies in developing alternative solutions for active devices. Two of the tools are called Standard Microcircuit Query Tool and QPL 19500 Qualified Products List Search and Query Tool. Within the past year, DSCC has established a DMSMS Program Office to support a more proactive role with its customers. In the past, DSCC has been primarily reactive to DMSMS alerts. As part of this proactive role, DSCC has worked with the larger weapon system program offices (B-1, B-2, F-18, F-15, GPS, M1A2, etc) on developing Joint Service/DLA solutions with parts suppliers. It is working with the GIDEP toward developing a national database, the Shared Data Warehouse.
Remarks	After verifying that there is a DMSMS part problem, DSCC assigns it a case number. DSCC processes approximately 100 cases

per 6000 alerts (1.67%) annually. DSCC handles 2.5 million parts. In comparison, NSWC/Crane under its Rapid Alert Notification (RAN) Program processes 1301 cases per 25,060 alerts (5.2%) annually. GIDEP distributes 66,135 alerts, but does not assign cases. DSCC made no specific recommendation for a collaborative effort, but it welcomes DND visits to discuss DSCC's new proactive approach.

NATIBO / DMSMS Site Visit Report

Organization Government-Industry Data Exchange Program (GIDEP)

Location US Naval Sea Systems Command (NAVSEA), Naval Warfare Assessment Station, Building 513, Corona, California

Point-of-Contact Robert Bennett, GIDEP Program Director, (909) 273-4677, bennettra@corona.navy.mil

Bill Pumford, Program Analyst, (909) 273-4289 pumfordwj@corona.navy.mil

Date Visited 3 October, 2000

Site Mission GIDEP is a DoD Joint Logistics Commanders chartered partnership between government and industry participants seeking to make maximum use of existing information. GIDEP is a government-wide central system for exchanging information among agencies about non-conforming products as well as DMSMS issues. GIDEP is funded by the U.S. and Canadian governments, and managed in Corona, California by the U.S. Navy.

DMSMS Practices The GIDEP database can be searched by NSN/Part Number to see if there is a DMSMS alert for an item. The DMSMS analyst can see previous and current actions used by other activities to resolve DMSMS situations. The GIDEP program also provides for exchange of information relative to part manufacturing, testing, operation, and characteristic data among industry and government agencies. It also may be used as a primary source of information for identifying substitute parts and redesign criteria. Access to information is available through designated GIDEP representatives at subscriber organizations, both public and private. Parts analysts should ensure coordination with their GIDEP representative to support DMSMS case investigations.

The GIDEP database covers several categories of concerns: engineering, failure experience, metrology, product information, and reliability and maintainability. This information is electronically distributed to GIDEP subscribers:

Engineering (65,219 documents)	Engineering Reports Soldering Technology Management Reports Test Reports Non-Standard Parts Part/Process Specifications

Failure Experience (8302 documents)	Agency Action Notices Alerts Safe Alerts Problem Advisories
Metrology (58,900 documents)	Calibration Procedures Technical Manuals Metrology Documents
Product Information (2,335 documents)	Product Specific
Reliability and Maintainability (3,749 documents)	Failure Analysis R&M Statistics R&M Predictions R&M Methodology
Urgent Data Request (753 documents)	Product Change Notices DMSMS Notices

The table below shows the steady growth of DMSMS actions, along with a comparison of electronics to non-electronics alerts, and to commercial parts:

Fiscal Year	Electronic Parts	Non-Electronic Parts	Commercial Parts
1996	29,985	1441	756
1997	27,800	5450	996
1998	34,580	2632	6,846
1999	39,247	3337	35,226
2000	66,135	2701	44,764

The Shared Data Warehouse is being developed by the GIDEP and the DLA, to enable subscriber activities to more effectively manage part obsolescence. The objective of the Shared Data Warehouse is to improve the sustainability of weapon systems by reducing the impact of diminishing manufacturing sources. The Shared Data Warehouse promotes a systematic, single methodology for processing notices of discontinuance and facilitates a central repository for DMSMS management tools. By applying business process evaluation practices that augment existing diminishing manufacturing sources screening processes, the Shared Data Warehouse provides rapid, economical identification, dissemination, and processing of diminishing manufacturing sources affected part numbers and national stock numbers.

The process currently includes database linking, intra-organizational collaboration, business process evaluation practices, and application of advanced information and electronic commerce technologies. Once fully operational in June, 2001, this pool of data will encompass data sources across DoD databases from the USAF, U.S. Army, and U.S. Navy repair activities, the Defense Supply Center, Columbus, the Defense Logistic Information Service (Battle Creek, Michigan), and GIDEP Operations Center (Corona, California).

Remarks

Every visited service activity was questioned about their use of GIDEP data. Most activities in DoD use GIDEP data as well as i2 Technologies, Inc, or MTI commercial databases, DND organic non-core electronics activities use GIDEP data exclusively, and the three Canadian contractors visited use GIDEP as well as i2 Technologies, Inc, MTI, and internal in-house databases. A few sites mentioned that GIDEP alerts were not always researched thoroughly, and they had to use an ancillary database. Raytheon Services Company/Canada mentioned that GIDEP's commercial parts tracking capability was more effective than their other databases.

U.S. Air Force

NATIBO / DMSMS Site Visit Report

Organization USAF Materiel Command DMSMS Hub

Location Air Force Research Laboratory (AFRL), Manufacturing Technology Division, Wright-Patterson AFB, Ohio

Point-of-Contact James Neely, DMSMS Program Manager, (937) 255-2456, James.Neely@wpafb.af.mil

Date Visited 3 August, 2000

Site Mission The USAF Materiel Command DMSMS Hub's primary function is to provide System Program Offices, Air Logistics Centers and other AF organizations with tools, information, and training for effective management of DMSMS in USAF weapon systems. Inclusive in this effort is policy and guidance, system support and analysis, tool development and test, and training design, development and delivery. The Hub manages the USAF's AVCOM indentured parts repository and publishes the Command's DMSMS Case Resolution Guide. The DMSMS Hub provides services to support SPOs, such as the F-22, F-15, AWACS, JSTARS, B-52, C-130 Gunship, WR/ALC Common Avionics, and WR/ALC Electronic Warfare Product Directorate.

DMSMS Practices The DMSMS Hub provides direct support to SPOs through its management information systems functions, DMSMS case resolution guidance, and educational programs.

<u>USAF Composite Electronic Component Database</u>
By bringing information from multiple programs into a common database, DMSMS issues are assessed on their impact across multiple programs in order to develop more cost-effective solutions. The DMSMS Hub sponsors the AVCOM commercial electronic part analysis tools with MTI and is pursuing the development of a similar capability for non-electronic components, Mechanical Obsolescence Management. AVCOM performs a number of functions required to effectively decrease the risk of DMSMS on USAF weapon systems. AVCOM offers an assessment of a real-time library of semiconductors offered by all worldwide manufacturers, projects component technology life cycles to reduce premature obsolescence, and automates indentured configuration management by identifying where components are used within the subject system and across other subscriber systems.

Another AVCOM feature is a "Health Model" projection of components, modules, circuit card assemblies, and whole systems to support long-term planning for DMSMS risk mitigation. In order to update the current AVCOM predictive tool, the DMSMS Hub is evaluating three new functions to the baseline USAF Composite: the Cross Command Component Module, the Custom Logistics Interface Module, and a Commercial-off-the-Shelf Module. The Cross Command Component Module will provide F^3I potential solutions across USAF systems. The Custom Logistics Interface Module will port logistics use and part inventory data directly from USAF logistics databases as part of DMSMS resolution assessment. The COTS Module will provide commercial component potential solutions across USAF systems. The DMSMS Hub is currently developing modules to interface USAF unique information systems/analytical tools with DLA's Shared Data Warehouse.

Applications Programs Indenture (API) Bi-directional Porting

The DMSMS Hub has developed a software application to allow direct porting of mechanical structure and electronic part information between the USAF API tool and the AVCOM analysis tool. This allows an AVCOM user to populate the API system with API avionics system data, and a non-AVCOM user to port part information from AVCOM into API.

Computer Based Training Development

The DMSMS Hub has made great strides in providing information for SPOs, ALCs and Product Directorates as their DMSMS issues were encountered. The USAF DMSMS Case Resolution Guide was published-and is available on the Hub web site, http://www.ml.afrl.af.mil/dpdsp/dmsms.htm). The Hub also hosts regular working group meetings to advise the Command of ongoing activities and provide periodic training and information dissemination.

Remarks

The DMSMS Hub is a service provider to a number of SPOs, ALCs and Product Directorates visited during recent site visits (OC/ALC, WR/ALC: F-15, C-5, B-2, C-130 Gunship, and Intercontinental Ballistic Missile field program offices, Common Avionics Directorate, Electronic Warfare Product Directorate). Recommendations from the visited activities strongly support expansion of this collaborative effort. The DMSMS Hub welcomes DND visits to discuss these new proactive approaches.

NATIBO / DMSMS Site Visit Report

Organization USAF Manufacturing Technology Division, Electronic Parts Obsolescence Initiative (EPOI)

Location Air Force Research Laboratory (AFRL), Building 653, Wright-Patterson AFB, Ohio

Point-of-Contact Tony Bumbalough, EPOI Project Engineer, (937) 904-4594, Tony_Bumbalough@afrl.ml.af.mil

Date Visited 15 August, 2000

Site Mission AFRLs Manufacturing Technology Division has been working for three years, on a five year effort, with eight contractors on a $21M initiative to seek solutions to managing obsolescence and DMSMS. There also is an $11M contractor cost share. EPOI covers three areas: (1) parts obsolescence management and re-engineering tools, (2) the application of commercially manufactured electronics, and (3) pilot demonstration programs.

DMSMS Practices Each of the three key areas of study will be summarized.

DMSMS Management and Re-engineering Tools

The goal in the area of parts obsolescence management and re-engineering tools is to provide the defense industry and USAF logistics centers with common, commercially available tools. The initiative seeks to determine which is the most cost-effective approach for DMSMS problem resolution with a particular system, and then to develop a structured approach for decision making.

Two contractors are working on obsolescence management decision tools. Litton TASC is developing a decision tool that is based upon their commercially available Resource Allocation Decision Support System. Aspect Development Inc./Raytheon is developing a decision tool that leverages Raytheon's expertise with business case analysis cost models and Aspect's expertise in electronic component predictive models.

Two contractors are working on re-engineering tools. The goal is to provide automated VHSIC VHDL model generation tools, libraries of catalogued simulatable and synthesizable virtual components and legacy software modeling. The strength of the tools is their ability to use F^3I information in automating the processes involved with re-engineering and manufacturing replacement units.

VP Technologies is creating a "Redesign Advisor" tool to evaluate the best approaches to redesign. They are using virtual prototyping, automated model generators, behavioral abstractors, costs and scheduling in their tool. TRW, along with subcontractors Mentor and Synopsys Electronic Design Automation, is developing the Behavioral Product Re-engineering (BPR) and Design Verification Test Generation (DVTG) Tools.

Application of Commercially Manufactured Electronics

The goal of this effort is to show how to adapt to commercial industry's (COTS) processes and device operating characteristics as they change over the coming years. This includes validated reliability prediction tools, packaging, and assembly of commercial Application Specific Integrated Circuits (ASICs), and improving access to commercial ASICs vendors. This effort is further segmented into reliability and Physics of Failure (PoF) prediction and ASIC availability. The goal of PoF is to move away from the costs associated with classical military qualification testing, and look to commercially validated PoF reliability modeling tools.

Four contractors are working on the PoF effort. Motorola is developing a neural network based software tool that integrates the validated, enhanced reliability/life prediction models. Northrop Grumman/Georgia Institute of Technology is looking at life cycle prediction for commercially manufactured ASICs that are used in military applications. Northrop Grumman/Intermetrics is using the Reliability Analysis Center modeling approach, evaluating ball grid arrays fine pitch packaging, plastic encapsulated microcircuits issues, and multi-chip modules. Boeing Phantom Works is using their software tool, Fatigue Synthesis for Avionics Programs, to predict the reliability of parts based on the part's technology and manufacturing processes.

Pilot Demonstration Programs

There are two pilot programs. They are intended to demonstrate technology insertion to systems, and to develop and document the DMSMS management business case. Northrop Grumman is benchmarking the F-16 APG-68 radar and applying the results to their common radar modules using their Parts Obsolescence Engineering Tools (POET) framework. Lockheed Martin is benchmarking F-16 and Patriot electronic subsystems and applying the results to the Joint Air-to-Surface Missile (JASSM), Full Authority Digital Engine Control (FADEC), and Low Cost Autonomous Attack System (LOCAAS) systems.

Remarks

Because this is an on-going R&D contract**,** EPOI made no specific recommendation for collaborative effort, but it welcomes DND visits to discuss these new proactive approaches.

NATIBO / DMSMS Site Visit Report

Organization	USAF Avionics Production Facility (AVPRO)
Location	Warner Robins Air Logistics Center (WR/ALC), Building 640, Robins AFB, Georgia
Point-of-Contact	Thomas Dills, AVPRO Manufacturing Manager, (478) 926-1428 tom.dills@robins.af.mil Michael Doubleday, AVPRO Engineering Manager, (478) 926-1428, mike.doubleday@robins.af.mil
Date Visited	20 September, 2000
Site Mission	AVPRO is responsible for repairing and duplicating electronic and mechanical parts for approximately 60% of electronic systems in the USAF inventory. Its 1100 technicians, engineers, and support personnel are involved in 2900 discrete line items and 80,000 units annually.
DMSMS Practices	AVPRO provides low volume manufacturing services. AVPRO has 550,000 square feet of environmentally controlled space, seven state-of-the-art indoor antenna ranges, three outdoor antenna ranges, printed circuit board production, hybrid microelectronic center, cable manufacturing, 16 laser-safe firing rooms, class 10,000 to 300,000 clean rooms, environmental test facilities, and a secret facility clearance. AVPRO handles communications, navigation, fire control, radar, radar warning, computers, electronic warfare, flare and flack dispensers, laser target acquisition, and infrared sensors. It manufactures printed circuit boards, hybrid microelectronics, flex, rigid, semi-rigid radio frequency cables and wiring harnesses, interface test adapters, test sets; all supported by computer aided design/computer aided manufacturing equipment for reverse engineering and generating technical data packages.
Remarks	AVPRO might be useful to DND and/or Canadian contractors as an alternate source for legacy system electronic and mechanical parts. Recommend that DND Service Activities and/or Canadian contractors review AVPRO Web Site once it is completed in Spring, 2001, or possibly schedule a tour of the facilities.

NATIBO / DMSMS Site Visit Report

Organization C-130 System Program Office

Location Warner Robins Air Logistics Center (WR/ALC), Building 300, Robins AFB, Georgia

Point-of-Contact

Avionics
Maj. Nate Ply, C-130 AMP Program Manager, (478) 926-2733
nathan.ply@robins.af.mil

Philip Eubanks, C-130 Engineering Manager, (478) 926-2853
philip.eubanks@robins.af.mil

Mechanical Structures
Edward Pratt, C-130 AF Programs Engineer, (478) 926-9602
Edward.pratt@robins.af.mil

Ray Waldbusser, C-130 Navy Programs Engineer, (478) 926-3661
Raymond.waldbusser@robins.af.mil

Date Visited 19 September, 2000

Site Mission The C-130 SPO manages all aspects of C-130 procurement, sustainment, and upgrades. The C-130 airframe was first introduced in the mid-1950's, and has over 70 different configurations. The most recent aircraft upgrade, the C-130J, is a commercial acquisition of a Lockheed Martin 382J. The C-130 is used by 65 countries throughout the world.

DMSMS Practices The USAF C-130 SPO is using a commercial electronic part analysis tool, AVCOM, from MTI, along with the USAF's API analysis tool, to analyze the various resolution solutions to DMSMS problems. AVCOM performs a number of functions. It offers an assessment of a real-time library of semiconductors offered by all world-wide manufacturers. It projects component technology life cycles to reduce premature obsolescence. It automates indentured API configuration management by identifying where components are used within the subject system, and across other subscriber systems. It offers obsolescence "Health Model" projection of components, modules, circuit card assemblies, and whole systems.

Due to problems associated with over 20 different avionics configurations, AVCOM recommended a complete ship-set modernization program. That finding, plus the worldwide Global Air Traffic Management (GATM) navigation requirements taking effect in 2008, drove the decision to modernize C-130 avionics. The C-130 SPO is running two concurrent upgrade programs: a

commercial aircraft upgrade C-130J program and a COTS avionics upgrade C-130 AMP (Avionics Modernization Program) program. Both upgrades will result in just two avionics configurations, with primarily commercial avionics installed.

Remarks

The C-130 SPO recommended that DND Service Activities and/or Canadian contractors may want to evaluate the AVCOM tool for possible use with Canadian C-130's and other possible DND weapon systems. The DND Air EPM may want to evaluate the new commercial avionics suites, or procure the older avionics systems replaced by the upgraded avionics suite.

NATIBO / DMSMS Site Visit Report

Organization USAF Common Avionics Systems Program Office (SPO)

Location Warner Robins Air Logistics Center (WR/ALC), Building 300, Robins AFB, Georgia

Point-of-Contact Levern Keels, Electronics Engineer, (478) 926-7637, keelsl@avionics2.robins.af.mil

Date Visited 19 September, 2000

Site Mission The Common Avionics SPO manages 614 USAF and FMS avionics LRUs. The SPO is responsible for repair and overhaul sustainment of these LRUs.

DMSMS Practices The USAF Common Avionics SPO is using a commercial electronic part analysis tool, AVCOM, from MTI, along with the USAF's API analysis tool, to analyze the various resolution solutions to DMSMS problems for legacy weapon systems. AVCOM performs a number of functions. It offers an assessment of a real-time library of semiconductors offered by all worldwide manufacturers. It projects component technology life cycles to reduce premature obsolescence. It automates indentured API configuration management by identifying where components are used within the subject system, and across other subscriber systems. It offers obsolescence "Health Model" projection of components, modules, circuit card assemblies, and whole systems.

The table below lists avionics systems that are currently loaded into the API database:

AAQ-9	APN-224	ARC-105	ARN-118	FYQ-116	SST-181
AAQ-13	APN-230	ARC-112	ARN-120	GRA-39	TPN-27A
AAQ-14	APN-232	ARC-114	ARN-127	GRC-171B(v)4	TPN-27B
AAS-35V	APN-236	ARC-123	ARN-131	GRC-171	TRC-170
ACC-3	APN-240	ARC-131	ARN-147	GRC-221	TRC-176
ACC-6	APQ-99	ARC-134	ARN-149	GRC-239	TRC-179
ACQ-7	APQ-110	ARC-148	ARN-152	GSM-122	TRC-181
ADC-101	APQ-113	ARC-150	ARN-154	GVT-1	TRC-186
AGM-129	APQ-114	ARC-164	ARR-85	GXQ-16	TRQ-35
AIC-10	APQ-122	ARC-165	ART-47	ID-249	TRQ-45
AIC-12	APQ-126	ARC-166	ASB-9A	ID-250	TSC-57
AIC-13	APQ-153	ARC-168	ASC-33	ID-331	TSC-60
AIC-18	APQ-157	ARC-169	ASG-22	ID-339D	TSC-85
AIC-23	APQ-159	ARC-171	ASG-23	ID-351	TSC-107
AIC-25	APQ-161	ARC-186	ASG-25	ID-387	TSC-110

AIC-26	APQ-166	ARC-187	ASG-26	ID-388	TSC-114
AIC-28	APQ-169	ARC-190	ASG-30	ID-663D/M	TSQ-146
AIC-33	APQ-171	ARC-200	ASG-31	ID-998	TTC-39E
APD-10	APQ-172	ARC-204	ASN-128	ID-1103	TVS-2/2A
APD-12	APS-133	ARC-222	ASQ-19/88	ID-9813-02	TYQ-6/9
APM-349	APX-46	ARC-229	ASQ-91	KY-532	URC-56
APM-362	APX-64	ARC-230	ASQ-121	MKA-28D	URC-107
APN-22	APX-65	ARC-513	ASQ-141	MN-26	URC-108
APN-42	APX-72	ARD-17	ASQ-151	MN-31	URC-119
APN-59E/F	APX-76	ARD-21	ASQ-153	MN-60C	URC-133
APN-69	APX-76	ARN-6	ASQ-176	MRC-107	URM-171
APN-70	APX-78	ARN-11	ASQ-184	MRC-117	URQ-31
APN-76A	APX-100	ARN-12	ASX-1	OA-3689	URQ-33
APN-133	APX-101	ARN-14	ATC-1	OA-8697	USC-48
APN-141	APX-103	ARN-17	AVQ-25	OD-106	URT-26
APN-147	APX-105	ARN-18	AVQ-26	OV-148/A	UXC-4
APN-150	APX-113	ARN-30E	AVQ-75	PAQ-1	UYC-10
APN-151	APY-1/2	ARN-31	AVS-6	PAS-6	UYC-9
APN-153	ARA-19	ARN-32	AVS-9	PQM-102A	VIR-30/31A
APN-154	ARA-25	ARN-47	AYC-1	PRC-119A	VOR-101V
APN-155	ARA-48	ARN-58	AYQ-12	PVS-2/2A	VRC-90
APN-157	ARA-50	ARN-59	AXQ-16	PVS-4	476U-2
APN-159	ARA-60	ARN-61	BQM-34	PVS-5	51R-1
APN-167	ARA-64	ARN-67	BR-3C	PVS-7	51V-1
APN-169	ARC-5	ARN-82	DFA-70A	PVS-14	51Y-1
APN-171	ARC-8	ARN-83	DFA-73	R-31A	51Y-3
APN-175	ARC-12	ARN-84	DFA-730	R-1041	51Y-4
APN-184	ARC-34	ARN-89	ED-100	RC-103	51Y-7
APN-190	ARC-49	ARN-101	FCC-99(V)	RCS-6A	51Z-2
APN-194	ARC-51	ARN-108	FRC-148	RF5-E	
APN-203	ARC-89	ARN-109	FRC-17X	RNA-34A	
APN-213	ARC-96	ARN-112	FRT-100	RXD-453	

Remarks

The USAF Common Avionics SPO recommended that DND and/or Canadian contractors involved with avionics repair and overhaul may want to review the list of serviced systems and evaluate whether they may want to discuss areas of joint interest.

NATIBO / DMSMS Site Visit Report

Organization USAF Electronic Combat Product Group

Location Warner Robins Air Logistics Center (WR/ALC), Building 226, Robins AFB, Georgia

Point-of-Contact Capt. Gerry Falen, ALQ-56M System Engineer, (478) 926-3823, Gerry.Falen@robins.af.mil

Date Visited 19 September, 2000

Site Mission Repairs, Tests, Upgrades all USAF Electronic Warfare equipment.

DMSMS Practices The USAF Electronic Combat Group maintains the Electronic Warfare Systems listed below:

AAR-44	AAR-47	ALE-20	ALE-24	ALE-40	ALE-45	ALE-47	ALE-48/49
ALIC	ALQ-122	ALQ-128	ALQ-131	ALQ-135	ALQ-144A	ALQ-153	ALQ-155
ALQ-157	ALQ-161A	ALQ-162	ALQ-172	ALQ-184	ALQ-188A	ALQ-196	ALR-20
ALR-46	ALR-56A	ALR-56C	ALR-56M	ALR-69	ALT-16	ALT-32	APM-427
APR-39A	APR-46/46A	QRC 81-01	QRC 84-02A	QRC 84-05	USM-464		

The USAF Electronic Combat Product Group (ECPG) has recently instituted a formal DMSMS program for all covered USAF Electronic Warfare systems. This effort is being funded by $24M from the Material Support Division Engineering and Mission Critical Degradation Program (out of $48.768M total funding). ECPG is using a commercial electronic part analysis tool, AVCOM, from MTI, along with the USAF's API analysis tool, to analyze the various resolution solutions to DMSMS problems for USAF Electronic Warfare systems. AVCOM performs a number of functions. It offers an assessment of a real-time library of semiconductors offered by all worldwide manufacturers. It projects component technology life cycles to reduce premature obsolescence. It automates indentured API configuration management by identifying where components are used within the subject system, and across other subscriber systems. It offers obsolescence "Health Model" projection of components, modules, circuit card assemblies, and whole systems.

Remarks While none of the electronic warfare systems serviced by ECPG are used by DND, the salient feature of this site visit was the recent

implementation of a DMSMS program; which was successful in attracting respectable funding.

NATIBO / DMSMS Site Visit Report

Organization F-15 System Program Office

Location Warner Robbins Air Logistics Center (WR/ALC), Building 301, Robins AFB, Georgia

Point-of-Contact David Lasater, Avionics Engineering Manager, (478) 926-4491, David.Lasater@robins.af.mil

Samuel Calloway, DMSMS Systems Engineer, (478) 926-3594, Samuel.Calloway@robins.af.mil

Date Visited 19 September, 2000

Site Mission The F-15 SPO manages all aspects of F-15 procurement, sustainment, and upgrades. The F-15 airframe was first introduced in 1969, and has gone through seven model upgrades. The F-15 is the USAF's premier air superiority fighter. It will be supplemented, then replaced, by the F-22. The F-15E Strike Eagle is a ground support variant.

DMSMS Practices The USAF F-15 SPO is using a commercial electronic part analysis tool, AVCOM, from MTI, along with the Air Force's Applications, Programs, and Indentures (API) analysis tool, to analyze the various solutions to DMSMS problems. AVCOM performs a number of functions: offering an assessment of a real-time library of semiconductors manufactured worldwide, projecting component technology life cycles to reduce premature obsolescence, and automating indentured API configuration management by identifying where components are used within the subject system, and across other subscriber systems. AVCOM also offers obsolescence "Health Model" projections of components, modules, circuit card assemblies, and whole systems.

The F-15 SPO has been proactively tracking component DMSMS problems for the past six years. It has formed partnerships with the following activities:

- F-15 airframe and avionics (less radar) - Boeing Company
- F-15 radar - Raytheon Company
- Replacement Component Technology Insertion, Ball Aerospace and Georgia Tech Research Institute
- Emulated Components, DSCC/Sarnoff Corporation's Generalized Emulation of Microcircuits Program
- AVCOM Database Maintenance, MTI

The F-15 SPO has addressed 244 component DMSMS problems in the past six years, with the following resolutions:

- 126 Digital Emulations: 54 Prototype Parts Delivered, 67 Emulations in Work, five on Purchase Order.
- 28 Non-Emulation Solutions: 17 Technology Insertion, 11 Redesign of Non-Emulation Parts.
- 90 Misc. Solutions: 18 Awaiting Funding, 51 Designed Out at Next Higher Assembly, 21 Awaiting Analysis.

F-15 Avionics DMSMS practices "lessons learned":

- Manage the Platform-Automate the Data: Monitor only **Flying** Parts and **Approved** Vendors, Set Up a Rapid Response Methodology.
- Balance the Design through a Disciplined System Engineering Process: Resolve Verticality Issues, and Evaluate Margins and Cones of Tolerance.
- Acquisition Reform Negatively Impacts Avionics DMSMS: Accelerates Military Component Discontinuance.
- ASIC's are the Most Vulnerable.
- The GEM program is a Cost Effective, Robust Approach to DMSMS Resolution.

Remarks

While DND does not use any F-15's, it does use CF-18's with a radar (APG-65 and APG-73) made by Raytheon, the same OEM for the F-15's APG-63 and APG-70 radar systems. After four upgrades of the older APG-63 radar, the F-15 SPO has now settled upon two designs: the APG-63(V)1 and the APG-70. While the technologies used were different for the APG-63 and APG-65, the technologies are very similar for the APG-63(V)1, APG-70, and the CF-18's APG-73. Prior to the introduction of the APG-63(V)1, Georgia Tech Research Institute conducted a study (1990) of the relative DMSMS health of the APG-63-111 radar, and compared it to the newer APG-70 radar. The study showed that even the newer APG-70 radar had serious DMSMS problems:

Radar System	Total Parts	Red Parts	Yellow Parts	Green Parts	Unique Parts	Unique Red	Unique Yellow	Unique Green
APG-63-111	8712	1455	4336	2921	572	210	201	161
APG-70-103	5377	1017	2071	2289	816	222	391	203

NATIBO / DMSMS Site Visit Report

Organization	USAF Technology and Industrial Support Directorate
Location	Warner Robins Air Logistics Center (WR/ALC), Building 323, Robins AFB, Georgia
Point-of-Contact	Andrew Adsit, Technology Insertion Engineering Mgr., (478) 926-6617, andrew.adsit@robins.af.mil Alton Basilico, Technology Insertion System Engineer, (478) 926-6617, alton.basilico@robins.af.mil
Date Visited	20 September, 2000
Site Mission	The Technology Insertion Group is an engineering service provider for all production programs at WR/ALC: C-5, C-130, C-141, F-15, U-2, Joint Stars, Common Avionics, Electronic Warfare, USAF Ground Vehicles and Test Equipment, Special Operations Forces, and USAF Guns and Missiles. The Technology Insertion Group is a policy maker and source of funds for DMSMS, obsolescence, and reliability and maintainability projects.
DMSMS Practices	The Technology Insertion Group provides component analysis for potential DMSMS cases determined by the SPO's at WR/ALC, as well as providing some funds for the SPO's to implement DMSMS projects.
Remarks	The purpose of the site visit was to introduce DND to the capabilities of the Technology Insertion Group. No specific recommendation was made for any collaborative effort.

U.S. ARMY

NATIBO / DMSMS Site Visit Report

Organization	U.S. Army Airborne Mission Division (Aircrew Survivability Communications)
Location	Communications and Electronics Command (CECOM), Building 300, Fort Monmouth, New Jersey
Point-of-Contact	Kenneth Brockel, Chief Airborne Mission Division, (732) 532-2394, kenneth.brockel@mail1.monmouth.army.mil Kathleen Rizzo, Contracting Officer for the PRC-112 Modernization Program, (732) 532-5798, rizzok@mail1.monmouth.army.mil
Date Visited	29 September, 2000
Site Mission	There are three commodity directorates at CECOM: Avionics, Communications, and Intelligence and Electronics Warfare. The Airborne Mission Division is part of the Communications Directorate. This division is responsible for procurement, sustainment, and upgrading aircrew survivability radios.
DMSMS Practices	CECOM does not have an assigned proactive DMSMS organization. They do have a small reactive DMSMS organization that verifies GIDEP alert notices, and distributes them to cognizant program offices. It's up to each directorate and program office to apply their most cost-effective resolution. Funding DMSMS projects is very difficult. During the site visit, only one current program was discussed: the ADY-1/PRC-112 Aircraft Survivability Radio System. U.S. Army, U.S. Navy, USAF, and several FMS countries' services use this system. Because of the large quantities involved, a reasonable Return on Investment analysis was generated to provide back-up rationale for outside-the-program funding. CECOM used U.S. Army Operating and Support Cost Reduction funds to contract a DMSMS analysis from the AMCOM. The Electronics Analysis and Prototyping Facility (EAPF) at AMCOM is responsible for the DMSMS activities. EAPF is using a commercial electronic part analysis tool, TACTRAC, along with their own in-house parts indentured analysis tool, to analyze the various resolution solutions to DMSMS problems for their AMCOM customer new and legacy weapon systems.

TACTRAC performs a number of functions. It offers an assessment of a real-time library of semiconductors offered by all worldwide manufacturers. It projects component technology life cycles to reduce premature obsolescence. It automates indentured configuration management by identifying where components are used within the subject system, and across other subscriber systems. It offers obsolescence "Health Model" projection of components, modules, circuit card assemblies, and whole systems. EAPF concluded that a complete modernization redesign was the most cost-effective solution for the ADY-1/PRC-112.

The PRC-112 Air Crew Survival Radio contains modules that are no longer being produced (the OEM is Motorola). The unavailability of these modules has led to a shortage of survival radios. CECOM has issued solicitation DAAB07-00-R-A018, responses due 18 October, 2000, for modernization/improvement of the PRC-112 radio. The PRC-112 is the ground base part of the Personnel Locator System AN/AYD-1. Other units are the airborne unit ARS-6 (V), program loader KY-913, and test set TS-4360-AYD-1. The AYD-1/PRC-112 is used on a number of U.S., Canadian, as well as worldwide aircraft.

Remarks

DND should review Canadian Forces PRC-112 requirements to ascertain if similar DMSMS issue exists for which collaborating on new contract may offer solution. The PRC-112 modernization program may be an opportunity for industry partnering between U.S. primes and Canadian suppliers. In addition, CECOM intends to modernize the other AYD-1 units in the near future.

NATIBO / DMSMS Site Visit Report

Organization U.S. Army Electronic Analysis and Prototyping Facility (EAPF)

Location Aviation and Missile Command (AMCOM), Research, Development and Engineering Center (RDEC), Building 5400, Redstone Arsenal, Huntsville Alabama

Point-of-Contact Bob Gibbs, EAPF Manager, (256) 313-0590, Bob.Gibbs@rdec.redstone.army.mil
Web Site www.redstone.army.mil/mrdec/mst

Date Visited 21 September, 2000

Site Mission EAPF is industrially funded by AMCOM to provide electronics analysis, design, prototyping, and limited production of electronic components for AMCOM managed weapon systems.

DMSMS Practices EAPF provides obsolescence management, circuit simulation and analysis, analog and digital electronic design, imbedded software development, reverse engineering, generation of Technical Data Packages, mechanical packaging, test hardware, and general program office electronics support. EAPF fabrication facilities provide double sided or multi-layer, flex/rigid flex, thru-hole or surface mount circuit card assemblies, radio frequency components and modules, cable and wire harness assemblies, chassis housings and assemblies, and transit/shipping containers.

EAPF provides its services to the following AMCOM program offices:

- Patriot, PAC-3, NMD, THAAD, Javelin, Hellfire, Avenger, ATACMS-BAT, MLRS Missile Systems.
- Apache, Kiowa Warrior, Blackhawk, UGV Aircraft Systems

EAPF is currently negotiating with the following AMCOM program offices to provide its services: CCAWS, CH-47, Comanche, and AEC.

The following major AMCOM program offices currently do not use EAPF: Shorad/Stinger, Sentinel, Hawk, Fixed Wing, ATC, and UAV.

EAPF is using a commercial electronic part analysis tool, TACTRAC, along with their own in-house parts indentured analysis tool, to analyze the various resolution solutions to DMSMS problems for their AMCOM customer new and legacy weapon systems. TACTRAC performs a number of functions. It

offers an assessment of a real-time library of semiconductors offered by all worldwide manufacturers. It projects component technology life cycles to reduce premature obsolescence. It automates indentured configuration management by identifying where components are used within the subject system, and across other subscriber systems. It offers obsolescence "Health Model" projection of components, modules, circuit card assemblies, and whole systems.

EAPF deals primarily with mil-spec build-to-print electronic parts. In general, mechanical parts are not yet subject to DMSMS problems for its subscriber program offices because most of these weapon systems are still in production.

Remarks

EAPF provides traditional mil-spec product support from DMSMS problem resolution (notification, verification, option analysis, and implementation) to system engineering support for performance trade-offs at subscriber program offices. EAPF might be useful to DND and/or Canadian contractors as an alternative source for legacy system electronic and mechanical parts. Recommend that DND Service Activities and/or Canadian contractors review the EAPF Web Site, or possibly schedule a tour of the facilities.

NATIBO / DMSMS Site Visit Report

Organization	U.S. Army Javelin Missile Program Office
Location	Aviation and Missile Command (AMCOM), Building 3651, Redstone Arsenal, Huntsville Alabama
Point-of-Contact	Bob Bergman, Javelin Engineering Manager, (256) 876-2115, bob.bergman@msl.redstone.army.mil Steve Pearce, EAPF System Engineer, (256) 842-9424 steve.pearce@rdec.redstone.army.mil George Collier, Javelin ILS Manager, (256) 842-9983 George.collier@msl.redstone.army.mil
Date Visited	21 September, 2000
Site Mission	The Javelin Program Office is responsible for procurement, sustainment, and upgrading Javelin Missile Systems. The total system consists of the wooden round missile, the man-portable launcher, and the fire control infrared system. The fourth missile upgrade is now in full production.
DMSMS Practices	The EAPF at AMCOM is responsible for the DMSMS activities for the missile and launcher tube. Interim Contractor Logistics Support is used for the Fire Control System. During the site visit, only the latest missile upgrade variant was discussed. EAPF is using a commercial electronic part analysis tool, TACTRAC along with their own in-house parts indentured analysis tool, to analyze the various resolution solutions to DMSMS problems for their AMCOM customer new and legacy weapon systems. TACTRAC performs a number of functions. It offers an assessment of a real-time library of semiconductors offered by all worldwide manufacturers. It projects component technology life cycles to reduce premature obsolescence. It automates indentured configuration management by identifying where components are used within the subject system, and across other subscriber systems. It offers obsolescence "Health Model" projection of components, modules, circuit card assemblies, and whole systems.

The biggest DMSMS problem with the missile is that the Safety and Arming Fuse (SAF) is no longer manufactured by the original supplier, Motorola. Testing a SAF from an alternative source, EMI, and a similar design from the Hellfire missile, did not resolve the problem. The solution was a new design from a new supplier, Perkin Elmer.

The Javelin missile is a wooden round; meaning it's treated just like an artillery shell. There is no electronics repair to the missile unless for an upgrade. Upgrade SAF designed missiles will replace older SAF technology missiles through the U.S. Army's Modernization Through Spares Program.

Remarks

The DND Javelin Missile is not the same as this Ground-to-Ground Anti-Tank system. The noteworthy issue for DND is the U.S. Army's use of its Modernization Through Spares Program to seamlessly replenish good parts for faulty parts. The wooden round concept does not require configuration managed parts at the component level.

NATIBO / DMSMS Site Visit Report

Organization	U.S. Army Patriot Program Office (PAC-3)
Location	Aviation and Missile Command (AMCOM), Redstone Arsenal, Huntsville, Alabama
Point-of-Contact	Don Dehart, Patriot ILS Manager, (256) 955-5438, don.dehart@patriot.redstone.army.mil Steve Pearce, EAPF System Engineer for Patriot, (256) 842-9424, steve.pearce@rdec.redstone.army.mil
Date Visited	21 September, 2000
Site Mission	The Patriot Program Office is responsible for procurement, sustainment, and upgrading Patriot Missile Systems. The total system consists of the certified round missile, the mobile launcher, the fire control radar, the search and acquisition radar, the missile loader, and the associated test equipment. The newest missile upgrade, the PAC-3, is now in full production.
DMSMS Practices	The EAPF at AMCOM is responsible for all DMSMS activities for the Patriot Missile System. During the site visit, only the latest PAC-3 missile upgrade variant was discussed. EAPF is using a commercial electronic part analysis tool, TACTRAC, along with their own in-house parts indentured analysis tool, to analyze the various resolution solutions to DMSMS problems for their AMCOM customer new and legacy weapon systems. TACTRAC performs a number of functions. It offers an assessment of a real-time library of semiconductors offered by all worldwide manufacturers. It projects component technology life cycles to reduce premature obsolescence. It automates indentured configuration management by identifying where components are used within the subject system, and across other subscriber systems. It offers obsolescence "Health Model" projection of components, modules, circuit card assemblies, and whole systems. EAPF deals primarily with mil-specs build-to-print electronic parts. EAPF analyzed 1100 components in the PAC-3 Missile System for DMSMS issues. From these 1100 components, 24 were considered obsolescence problems. Of these 24, nine were resolved via bridge buys followed by a redesign of the component, and fifteen were resolved via use of alternative part, qualifying a new supplier, or redesign of the next higher level assembly. In addition to its PAC-3 work, EAPF has analyzed 520 modules from the baseline Patriot system. From these 520 modules, 151components were judged obsolete. The Patriot Program Manager has tasked EAPF to

analyze 155 circuit card assemblies for the baseline Patriot system. Since March, 2000, the Patriot program has tasked EAPF to review 131 of its own alert notices (14,102 parts) and 276 GIDEP notices containing 62,369 parts. There were no mechanical DMSMS problems because the PAC-3 system is in production.

Eight FMS countries operate the Patriot system. Each is responsible for its own configuration management and sustainment. The Patriot Program Office is not responsible for FMS system DMSMS resolutions, but it does notify FMS users of DMSMS problems at the circuit card assembly level.

Remarks

The Patriot Missile is a certified round part. That means it does not require pre-launch performance verification. Fail-to-Fire missile electronics are maintained at the U.S. Army Letterkenny Depot. Even though the PAC-3 missile is a recent design, it is noteworthy that there were a substantial number of obsolete parts.

NATIBO / DMSMS Site Visit Report

Organization	U.S. Army Shorad/Stinger Missile Program Office
Location	Aviation and Missile Command (AMCOM),Redstone Arsenal, Building 5308, Huntsville, Alabama
Point-of-Contact	LTC Earnest David Harris, Shorad Program Manager, (256) 842-6034, Earnest.Harris@redstone.army.mil Dave Locker, Shorad System Engineer, (256) 842-0163 David.Locker@rdec.redstone.army.mil Larry Calloway, Shorad ILS Manager, (256) 842-7192 Larry.Calloway@redstone.army.mil
Date Visited	21 September, 2000
Site Mission	The Shorad Program Office is responsible for procurement, sustainment, and upgrading all weapon system applications using the Stinger missile. The Stinger missile system consists of the wooden round missile, the man-portable launcher, and the fire control/identification friend or foe system. The latest missile modification in 1994 is now in limited production. DoD is only buying replenishment missiles; all new missile sales are FMS.
DMSMS Practices	The Shorad Program Office formed a DMSMS/Obsolescence Team 18 months ago to address component obsolescence problems with the eight Stinger missile Hybrid Microelectronics Assemblies (HMA's). Suppliers have discontinued a number of components on all eight HMAs due to low production quantities. Shorad engineers have recommended LOT buys when possible (but the Stinger service life keeps getting extended), alternate part suppliers, plastic encapsulated devices (uncovered unique failure modes), and emulated parts. Shorad engineers evaluated redesigning the eight HMA's using DMEA VHSIC VHDL to convert to circuit card assemblies that can be upgraded more easily. Availability of funding is delaying resolution of these problems. DoD does not have a current budget line to upgrade replenishment spares, and FMS customers are unwilling absorb the entire upgrade cost. The Shorad Program Office is pursuing funds via the U.S. Army's Total Ownership Cost Reduction Program or Operating and Support Cost Reduction Program.
Remarks	The Shorad DMSMS dilemma with finding funding is typical of many legacy military systems.

U.S. NAVY

NATIBO / DMSMS Site Visit Report

Organization U.S. Naval DMS Technology Center

Location Naval Sea Systems Command (NAVSEA), Naval Surface Weapon Center (NSWC), Building 2940W (Code 6025), Crane, Indiana

Point-of-Contact Rich Samuelson, Technology Obsolescence Branch Manager, (812) 854-6418, samuelson_rich@crane.navy.mil

Mark Chestnutwood, Director Microelectronics Engineering Department, (812) 854-2401, chestnutwood_m@crane.navy.mil

Date Visited 8 November, 2000

Site Mission NAVSEA/Crane provides acquisition, engineering, logistics, and maintenance for the Fleet's weapon and electronic systems. The 37 person technical staff of the U.S. Navy's DMS Technology Center is based at Crane. The DMS Technology Center is industrially funded, and works closely with other U.S. Navy repair activities.

DMSMS Practices The DMS Technology Center (DTC), as part of Crane's Microelectronics Engineering Department (Code 602), provides a number of DMSMS capabilities:

- RAN subscriber parts monitoring and notifications
- Analysis of equipment cost ownership and asset re-utilization
- Comprehensive DMSMS risk assessment
- Life cycle cost forecasts
- Program parts selection
- Replacement part research and recommendation
- Producibility analysis
- Generalized Emulation of Microcircuits design and testing
- Component failure analysis

The DMS Technology Center has developed an in-house tool, the RAN program. In FY99, DTC processed 25,060 part alert notices, of which 1301 required additional research, 1210 involved an alternative part, and 91 remained under investigation. Due to their recent enhanced capabilities to process commercial parts, Crane has added a number of non-governmental commercial customers.

Performance-based Business Case Analysis (BCA) derived costing has been implemented only since the mid-1990's, and has been applied to primarily newer weapon systems. BCA provides the foundation for making cost-effective decisions regarding the use of commercial support for DoD weapon systems. However, a well-structured BCA also provides a methodology to fully define the

nature and scope of the application and transition from current support to the new commercial application. It serves as an essential source of proposed alternative information and its impact on the existing DoD support infrastructure. It becomes the source of cost and performance baseline data for structuring and managing the implementation of the commercial support solution. Two BCA examples from the site visits were of particular interest: DTC's use of their TORA and TeAM tools.

Technology Obsolescence Risk Assessment (TORA)
TORA identifies near and long-term life cycle support problems based upon mission requirements, current system configuration, product supply availability, product survey information and recommended solutions. As part of this analysis, DTC uses the following decision management support programs/tools: TACTRAC, Information Handling Services (IHS) Haystack, IHS CAPSXpert, PCLink, various manufacturers' links, DoD DMSMS Teaming Group database, DSCC databases, various military and commercial cost models, and extensive COTS market surveys.

Technology Assessment and Management (TeAM)
Using the TeAM tool, DTC performs both a technical feasibility analysis and an economic viability analysis on a target weapon system, LRU, circuit board, or component, in order to determine if equivalent functionality can be achieved using commercial parts or systems. The output of this analysis is an initial "roadmap", that identifies windows of opportunities for a technology refresh of affected items. Data that is used to determine technology or device obsolescence is obtained through on-going surveys of device manufacturers and by in-house engineering expertise. Based on this roadmap, solutions-scenarios are recommended that are technically feasible and concurrent with weapon system objectives. A cost estimate to implement each scenario is made based upon the scope and complexity of the change. A trade-off analysis is then conducted to determine the optimum solution.

Crane's DTC is industrially funded by subscriber NAVSEA organizations. DTC services the following shipborne systems:

AEGIS	AN/BSY-1	AN/BSY-2
AN/SLQ-32	AN/SPS-40/49	AN/SQQ-89
AN/UYK-43	AN/UYK-44	AN/WCQ-2A
AN/WCQ-6	CEC	CSTS
ICAS	MACHALT360	MCCS
NULKASP-22, 23, & 24		RD-358
SPS-48	SPS-67	SRQ-4
UQN-4A	USH-26	UYH-16
UYQ-21		

As part of its continuing cooperation with RTSC, DTC also services the following non-NAVSEA airborne systems:

AH-64	ALQ-99	E-2C APS-145
OH-58	NIGHT EAGLE	

Remarks

In its application of the TORA and TeAM programs, the DMS Technology Center is demonstrating its implementation of post-acquisition reform performance-based business case analysis approaches. In several examples discussed, the real time TOC savings were impressive. Even though DND only has common CF-18 systems that are part of the DTC and RTSC team's TORA/TeAM/RAN subscriber list, both DND Air EPM and Maritime EPM might want to evaluate these tools for possible DND use.

NATIBO / DMSMS Site Visit Report

Organization	U.S. Navy Surface Warfare Engineering Facility (SWEF)
Location	Naval Sea Systems Command (NAVSEA), Naval Surface Warfare Center (NSWC), Port Hueneme, California
Point-of-Contact	Jerry G. Martinez, DMS Advocate, Code 5A12, (805) 228-8197, MartinezJG@phdnswc.navy.mil
Date Visited	4 October, 2000
Site Mission	SWEF is responsible for logistics support and system upgrade engineering for the Aegis system, fire control radars for Phalanx, MK-45, MK-49, and MK-86 gun systems, as well as Standard, Sea Sparrow, Rolling Airframe Missile, Harpoon, and Tomahawk missiles. SWEF also is responsible for operational software development for naval fire control and missile launch systems.
DMSMS Practices	SWEF is using a commercial electronic part analysis tool, TACTRAC, along with their own in-house parts indentured analysis tool, to analyze solutions to DMSMS problems for assigned new and legacy weapon systems. TACTRAC performs a number of functions. It offers an assessment of a real-time library of semiconductors manufacturers worldwide. It projects component technology life cycles to reduce premature obsolescence. It automates indentured configuration management by identifying where components are used within the subject system, and across other subscriber systems. It offers obsolescence "Health Model" projection of components, modules, circuit card assemblies, and whole systems. SWEF maintains an engineering database of subscriber system technical data packages, product drawings, bill-of-materials, and other engineering documents to support the assigned systems. Because of their software development capabilities, SWEF has been able to replace obsolete fire control, missile launcher, and surveillance system computers and computer peripheral devices (printers, memory units, etc.) with COTS hardware without the typical legacy software integration problems. One notable example is their replacement of military specification fire control and missile launch consoles ($900K each) with equivalent COTS consoles ($30K each).
Remarks	The DND Maritime EPM Office might be interested in evaluating SWEF's COTS replacement capabilities for DND's shipborne fire control and missile launch systems. No specific DND system was highlighted.

NATIBO / DMSMS Site Visit Report

Organization Naval Logistics Productivity (NLP) R&D Center

Location Naval Supply Systems Command (NAVSUP), Building 309, Mechanicsburg, Pennsylvania

Point-of-Contact James E. Fitzgibbon, NLP Program Manager, (717) 605-1300, James_E_Fitzgibbon@navsup.navy.mil

Date Visited 27 September, 2000

Site Mission NLP is responsible for U.S. Naval DMSMS policy administration and logistics R&D. NLP does not have engineering design or device/circuit board fabrication facilities.

DMSMS Practices NLP has pushed U.S. Navy logistics R&D into three different directions under its Virtual System Implementation Program:

- Rapid Re-Targeting - A software VHDL redesign tool used to capture the operating functions of obsolete circuit card assemblies, modules, and whole systems so that newer technology hardware can be built independent of the electronics technology used and have identical performance to the original functions.
- Compatible Processor Upgrade Program – Use of a newer technology processor that is programmed to run weapon system legacy software. In this way, the user does not suffer operating problems associated with using legacy software on newer hardware.
- Obsolescence Prediction Tool – Combination of the commercial TACTRAC parts tracking program made by i2 Technologies Inc., and U.S. Navy subscriber systems indentured databases.

NLP's rapid re-targeting software tool has been used to redesign numerous circuit boards and components for a number of production systems. Examples include:

- NLP analyzed 41 unique circuit card assemblies (CCA's) and 199 unique microcircuits for the ALQ-126B. They developed a single UniModule that can replace eight different CCA's; and have 43 VHDL microcircuit functional equivalents.
- Developed a single UniModule that can be field-programmed to replace 71 unique CCA's for the SPS-6.
- Developed a single UniModule that can be factory programmed to replace six unique CCA's for the UYK-44.

- Developed a single UniModule that can be dip switch programmed to replace ten CCA's for the MK-23 TAS.
- Developed a single UniModule that replaces 66 CCA's for the BSY-1 sonar system.

NLP DMS effort is supported through congressionally directed language in the defense appropriations bill.

Remarks

NLP suggested a possible joint project with DND, or a Canadian company, to evaluate the same or other CF-18 ALQ-126B CCA's for potential rapid re-targeting redesign candidates.

NATIBO / DMSMS Site Visit Report

Organization Raytheon Technical Services Company (RTSC)

Location 6125 East 21st Street, Indianapolis, Indiana (Formerly NAVSEA/Naval Air Warfare Center)

Point-of-Contact David Devine, Sustainment Engineering Project Manager, (317) 306-3114, Devined@indy.raytheon.com

David Roberts, Engineering and Production Support Project Manager, (317) 306-4426, robertsd@indy.raytheon.com

Date Visited 9 November, 2000

Site Mission RTSC operates the privatized repair depot/limited production facility in Indianapolis, Indiana. This facility was formerly the NAVAIR Naval Avionics Center. Working with NAVSEA/ Crane's RAN program and with its own contractor-developed tools, RTSC processes alerts for NAVAIR systems, U.S. Army systems, USAF systems, FMS systems, non-military government systems, and commercial systems. RTSC also processes parts alerts for other Raytheon manufactured systems that are built at Indianapolis, or at other Raytheon facilities.

DMSMS Practices RTSC avionics repair depot and limited production facilities have the following capabilities:

- Test and evaluation
- Troubleshooting/Repair of airborne and ground based radars, electro-optic fire control systems, bomb racks and launchers, and communications equipment
- Upgrades/Modifications
- Warranty support
- Spares manufacturing
- Field teams
- Environmental testing
- Sustainment engineering
- Performance based logistics

RTSC provides its industrially funded services to NAVAIR primarily, but it also provides support to the following subscribers:

U.S. Government Customers System Serviced

NAVAIR/NAVICP	Launchers, Bomb Racks, Pylons, CDTs, DTRs APG-65 and APG-73 Radars (F/A-18, AV-8B) AWG-9 and APG-71Radars (F-14) F-14 Tactical Air Recon Pods (TARPS) ARC-182 Transceivers Misc. Out-of-Production Items
NAVAIR	Weapon Data Link and Pods
AMCOM	BFVS Fire Control System and Support Equipment
ACALA/Rock Island	M1 Thermal Imaging Systems, Laser Rng Finders
CECOM	Firefinder
Misc. FMS	APG-65 and APG-73 Radars (F/A-18, AV-8B)
NSWC/Crane	EP-3E Mission Avionics
Oklahoma City-ALC	AXQ-14 Data Link Upgrades
Warner Robins-ALC	APG-63(V)1 Radar (F-15)

Other Customers System Serviced

Internal Raytheon	B-2 Radar Repair, APG-73 Radar (F/A-18) BFVS AIM XXI Modification Kits
Boeing/Ft Walton Beach	AC-130 Gunship Radar
Boeing/St Louis	APG-63(V)1 Radar
Litton	CDTs
Misc.	Chaparral and TOW
Hyundai, ROC	K1 Thermal Imaging System, Laser Range Finders
INDRA, Spain	APG-65 Radar (EF-18, AV-8B)
Korea	Gunners Primary Tank Thermal Site (GPTTS)
NAMSA, Saudi, Taiwan Netherlands, Korea, Singapore, Australia	Firefinder
Philips, Australia	APG-65 Radar (F/A-18)
NATO, Taiwan,Hughes Malaysia	Air Defense Radar (HADR)

As part of its performance based logistics system, RTSC Sustainment Engineering conducts the following activities:

- Qualification of system readiness, supportability, and affordability
- System support cost analysis, using TORA

- Planned insertion of new technology, using TeAM and TACTRAC
- Life cycle cost forecast, using TORA
- Naval Aviation Logistics Data Analysis/3M data analysis
- Predictive information for system life support
- Maintenance plan technical assessments, using EAGLE and Advanced Integrated maintenance Support System (AIMSS)
- Affordability readiness technology management, using TeAM
- Reparability analysis

Technology Obsolescence Risk Assessment (TORA)
TORA identifies near and long-term life cycle support problems based upon mission requirements, current system configuration, product supply availability, and product survey information. The output of this analysis is an initial ”roadmap”, that identifies windows of opportunities for a technology refresh of affected items. Data that is used to determine technology or device obsolescence is obtained through on-going surveys of device manufacturers and by in-house engineering expertise. Based on this roadmap, solutions-scenarios are recommended that are technically feasible and concurrent with weapon system objectives. A cost estimate to implement each scenario is made based upon the scope and complexity of the change. A trade-off analysis is then conducted to determine the optimum solution.

Technology Assessment and Management (TeAM)
Using the TeAM tool, RTSC performs both a technical feasibility analysis and an economic viability analysis on a target weapon system, LRU, circuit board, or component, in order to determine if equivalent functionality can be achieved using commercial parts or systems. As part of this analysis, RTSC uses the following decision management support programs/tools: TACTRAC, IHS Haystack, IHS CAPS, PCLink, various manufacturers’ links, DoD DMSMS Teaming Group database, DSCC databases, various military and commercial cost models, and extensive COTS market surveys.

TACTRAC
RTSC is using a commercial electronic part analysis tool, TACTRAC, along with an in-house parts indentured analysis tool, to analyze the various resolution solutions to DMSMS problems. TACTRAC performs a number of functions. It offers an assessment of a real-time library of semiconductors offered by all worldwide manufacturers. It projects component technology life cycles to reduce premature obsolescence. It automates indentured configuration management by identifying where components are used within the subject system, and across other subscriber systems. It offers obsolescence “Health Model” projection of components, modules, circuit card assemblies, and whole systems.

Enhanced Automated Graphical Logistics Environment (EAGLE)
EAGLE is an integrated database system designed to provide real-time solutions for automating logistics, provisioning, and technical publication tasks. EAGLE consists of software tools, both Raytheon and third party COTS, that provide users with an innovative and powerful logistics database application optimized for the Windows operating environment. It is the only commercially available system that can automatically produce technical manuals from a logistics database, Interactive Electronic Technical Manual (IETM), and Hypertext Markup Language output for publication over the World Wide Web. Additionally, EAGLE provides the ability to access and mark up engineering drawings and illustrations, and the database can be completely deployed in the field using a notebook computer.

Advanced Integrated Maintenance Support System (AIMSS)
Raytheon is recognized as one of the leaders in the conceptual and practical application of IETM technology products. AIMSS, Raytheon's interactive authoring tool, was produced based on 15 years of R&D in the field of electronic presentation and interactive maintenance information. IETM technology provides a means to efficiently manage and use information without the disadvantages of paper volumes.

Mission Readiness Practices
Important parameters such as mean-time-between-failures, mission capable rates, platform availability, mean-time-between-repairs, etc, are some of the factors affecting DMS practices. The level of mission criticality for a given weapon system determines to a great extent the timeliness of potential DMSMS solutions. For example, if a key component becomes obsolete, the responsible activity may want to consider a bridge buy to cover the time required for a redesign; if that action is determined to be the most cost-effective solution.

An example of a mission readiness practice is NAVSEA/Crane and Raytheon Technical Services Company/NAC joint use of the TeAM tool applied to specific common avionics systems that were highlighted on a stoplight chart used by NAVAIR PMA-209N program office. PMA-209N lists every aircraft that they're responsible for, along with every indentured common avionics system installed. Their stoplight chart is color-coded red, yellow, and green to show the relative status of every system's contribution toward mission readiness. The rating is based upon equipment reliability, mission criticality, and cost of mission capable status. Crane and RTSC used the TeAM tool for selected "red" systems to give BCA based DMSMS solution options.

Remarks

RTSC's performance based logistics system has impressive capabilities to address business case issues as well as military operations issues. RTSC has the facilities to carry out the sustainment engineering analyses. In addition to the intra-company conversations between Raytheon Systems Canada/Calgary and RTSC, RTSC extends a visit invitation to other DND Service Activities and/or Canadian contractors.

NATIBO / DMSMS Site Visit Report

Organization	U.S. Navy Aging Aircraft Program
Location	Naval Air Systems Command (NAVAIR), Building 2185, Patuxent River, Maryland
Point-of-Contact	Bob Ernst, Air-4.1D Aging Aircraft Program Manager, (301) 342-2203, ernstrp@navair.navy.mil
Date Visited	28 September, 2000
Site Mission	The U.S. Navy Aging Aircraft Integrated Product Team (AAIPT) is funded by NAVAIR 4.0, and is responsible for setting resolution policy regarding a number of categories affecting legacy aircraft systems: avionics DMSMS/obsolescence, wiring, structural corrosion, engines, hydraulic components, and dynamic systems. In addition to its avionics DMSMS policy role, the AAIPT also evaluates part analysis tools such as TACTRAC, RAN, TORA, TeAM, Free Trade Zone and other in-house contractor systems; as well as performing case studies for selected aircraft systems to determine an optimum solution.
DMSMS Practices	The AAIPT assists any U.S. Navy aircraft program office that requests help. They work closely with other U.S. Navy groups, such as NSWC/Crane, NUWC/Keyport, and RTSC to solve avionics DMSMS and obsolescence problems. Currently the AAIPT is working with teams from the F-18, S-3, P-3, E-2/C-2 and other legacy weapon systems. The AAIPT uses TACTRAC, Parts Plus, and Free Trade Zone part analysis tools as part of the part obsolescence service they provide. TACTRAC, Parts Plus from MTI, and Free Trade Zone, from Parts Minor Company, along with in-house Obsolescence Management Process parts indentured analysis tool, are used to analyze the various resolution solutions to DMSMS problems. Both TACTRAC and Free Trade Zone tools perform a number of functions. They offer an assessment of a real-time library of semiconductors offered by all worldwide manufacturers. They project component technology life cycles to reduce premature obsolescence. AAIPT automates indentured configuration management by identifying where components are used within the subject system, and across other subscriber systems. The two parts tracking tools offer obsolescence "Health Model" projection of components, modules, circuit card assemblies, and whole systems.

As part of their analytical capabilities, they have developed a Failure Analysis System that evaluates operational and systemic causes of high failure rates in various avionics systems. This tool analyzes equipment environmental issues, such as vibration and shock, temperature effects, aircraft heating and cooling system effectiveness, etc., to try to determine the root causes of part failures that accentuate DMSMS/obsolescence problems. They try to present a set of options to the requesting program office that gives him both logistics and operational solutions. They are currently adding an in-house capability to offer cost estimates they believe are more realistic than existing cost models.

Remarks

Based upon their analyses of the U.S. F-18 APG-65 and APG-73 radar systems, the Canadian Forces representatives attending this meeting expressed interest in a possible joint activity concerning the CF-18 APG-65 and APG-73 radar systems.

While not specifically part of the DMSMS meeting, the AAIPT would like to discuss wiring and arcing solutions, as well as recent corrosion control solutions, with DND Service Activities and Canadian contractors.

NATIBO / DMSMS Site Report

Organization	NAVSEA Undersea Warfare Center, Custom Engineered Solutions, Material Support Team
Location	Naval Sea Systems Command (NAVSEA), Naval Undersea Warfare Center (NUWC) Division Keyport, Keyport, Washington
Point-of-Contact	John Tilton, Fleet Systems Sustainment Division Manager, (360) 315-7472, jtilton@kpt.nuwc.navy.mil Steve Osburn, Customer Advocacy Group, (360) 315-7409, sosburn@kpt.nuwc.navy.mil
Date Visited	Submitted by Organization
Site Mission	The Custom Engineered Solutions, Material Support Team (CES/MST) is dedicated to be the leaders in the sustainment of legacy electronic, electromechanical, and mechanical systems while managing the changes in material support of electronic systems in a world of continuously advancing technology.
DMSMS Practices	The CES/MST is charged with assisting any Government or private program/project office that requests help. CES/MST works closely with other Government groups, such as Naval Surface Warfare Center Point Hueneme Division, National Oceanographic and Atmospheric Administration, NUWC/Newport, NAVAIR AAIPT, DMEA, NAVSUP's Rapid Retargeting Program, Naval Inventory Control Point, DLA, and many others to solve DMSMS/obsolescence and sustainment issues on a wide variety of USAF, U.S. Navy, and U.S. Army platforms through the DoD DMSMS Teaming Group and individual project support. The CES/MST uses TACTRAC, Free Trade Zone, and an in-house tracking Database with over 12 years of historical data as part of the analysis tools to provide a part obsolescence service. These analysis tools are used to analyze the various proposed resolution paths to any DMSMS/obsolescence issues. Both TACTRAC and Free Trade Zone tools perform a number of functions. They offer an assessment of a real-time library of semiconductors offered by all worldwide manufacturers. They project component technology life cycles to reduce premature obsolescence. CES/MST automates indentured configuration management by identifying where components are used within the subject system, and across other subscriber systems with the "Tracker" in-house Management tool. The two commercially based parts tracking tools offer obsolescence "Health Model" projection of components, modules, circuit card assemblies, and whole systems.

As part of their analytical capabilities, CES/MST Keyport has developed a failure analysis add-on tool that evaluates operational and systemic causes of high failure rates in various systems. This tool analyzes equipment environmental issues, such as vibration and shock, temperature effects, heating and cooling system effectiveness, etc., to try to determine the root causes of part failures that accentuate DMSMS/obsolescence problems. CES/MST Keyport presents a set of options to the requesting program office that gives both logistics and operational solutions. CES/MST Keyport is currently adding an in-house capability to offer cost estimates they believe are more realistic than existing cost models when applied to primarily newer weapon systems. Business Case Analysis (BCA) provides the foundation for making cost-effective decisions regarding the use of commercial support for DoD weapon systems. However, a well-structured BCA also provides a methodology to fully define the nature and scope of the application and transition from current support to the new commercial application. It serves as an essential source of proposed alternative information and its impact on the existing DoD support infrastructure. It becomes the source of cost and performance baseline data for structuring and managing the implementation of the commercial support solution.

Electronic Component Technology Assessment (ECTA)

ECTA identifies near and long-term life cycle support problems based upon mission requirements, current system configuration, product supply availability, and product survey information. The output of this analysis is an initial ”roadmap”, that identifies windows of opportunities for a technology refresh of affected items. Data that is used to determine technology or device obsolescence is obtained through on-going surveys of device manufacturers and by in-house engineering expertise. Based on this roadmap, solutions-scenarios are recommended that are technically feasible and concurrent with weapon system objectives. A cost estimate to implement each scenario is made based upon the scope and complexity of the change. A trade-off analysis is then conducted to determine the optimum solution. Using the ECTA tool, CES/MST Keyport performs both a technical feasibility analysis and an economic viability analysis on a target weapon system, LRU, circuit board, or component, in order to determine if equivalent functionality can be achieved using commercial parts or systems. As part of this analysis, CES/MST Keyport uses the following decision management support programs/tools: TACTRAC, IHS Haystack, Weapons Systems File, Free Trade Zone, various manufacturers’ links, DoD DMSMS Teaming Group database, DSCC databases, various military and commercial cost models, and extensive COTS market surveys.

CES/MST Keyport is funded by subscriber organizations.
CES/MST Keyport provides expertise to the following systems:

AEGIS	AN/BSY-1	SEAWOLF
AN/SQQ-32	AN/SPS-40/49	NOAA/NEXRAD
AN/SQQ-34	MK-46/48	ARCI
SP-22, 23, & 24	F-18	AV8-B
AN/SQS-56/DE1190	P-3/ S-3	E2-C APS-145
ATWCS	CCS Mk 2	

Remarks

CES/MST Keyport invites NATIBO and other DMSMS information users/partners to visit their facility anytime. Along with the electronic devices support, CES/MST Keyport provides material and mechanical assembly support through prototype and developmental manufacturing process facilities. Complete environmental screening, and Failure Analysis, all integrated into any team for any customer requirements.

Department of National Defence Canada

NATIBO / DMSMS Site Visit Report

Organization Department of National Defence (DND) Headquarters

Location 101 Colonel By Drive, Ottawa, Ontario, CANADA

Point-of-Contact Maj. G. Dennis Clark, Americas Team/International and Industry Programs (DGIIP), (613) 996-7153, af718@issc.debbs.ndhq.dnd.ca

Date Visited 17 October, 2000

Site Mission The DND Defense Headquarters is equivalent to the DoD's Pentagon. They are responsible for implementing Canadian military policy, procedures, and activities.

DMSMS Practices DND is organized differently than DoD. For example, instead of having aircraft in all Services as is the case for DoD, DND has a Air Staff that handles all fighters, cargo, utility, trainer, and rotary wing aircraft. Its Maritime Staff handles all surface and submarine vessels. Its Land Staff handles all soldier, vehicle, and communications programs. There are separate Equipment Program Management (EPM) offices that include program managers, financial support, logistics, engineering, contracts, etc. to manage all aspects of each assigned weapon system, as well as common-usage systems. This is similar to the System Program Manager structure in DoD.

The traditional three tiered logistics system ("O-Level", "I-Level", and Depot), supported by a supply point, is being changed to include more contractor-based intermediate and depot level maintenance due to tightening budget constraints. DND still performs O-Level repairs, and still controls weapon system configuration management.

Due to a $C10B annual defense budget, as compared to the $300B annual DoD budget, DND does not have the same level of dedicated DMSMS support. There were five areas of DMSMS, or potential DMSMS, activities within DND that were discussed during a week of Canadian site visits:

1. The Common Avionics Equipment Program Management (EPM) office has used GIDEP alerts as part of its LOT buy response policy.
2. Harris/Canada is under contract to provide CF-18 non-core avionics repair and CF-18 test equipment I-Level/Depot repair. Harris's chief subcontractor, Raytheon/Canada is responsible for CF-18 radar I-Level and Depot repair (separate trip report).

3. Canadian Computing Devices is under consideration for a 20-year contractor logistics support contract for the Iris communication system (separate trip report).
4. Bell-Textron/Canada is under contract to provide Total System Performance Responsibility for the CH-146 Griffon helicopter (separate trip report).
5. DND is developing a new supply information system, the Material Acquisition and Support Information System (MASIS).

Common Avionics EPM LOT Buy Practice

During discussions regarding their LOT buy practices, the Common Avionics Equipment Program Manager (EPM) office in Ottawa expressed their rationale for using LOT buys. They feel that it is cheaper to store current design inventory for smaller fleets of aircraft than to pay for redesign of the equipment and all of its associated logistics costs. They also rely exclusively upon GIDEP part alerts, and not on TACTRAC or AVCOM commercial analysis tools.

The premise behind the LOT buy is that an end item is being discontinued by the original manufacturer, and he is offering a last time buy of service life quantities. At first glance, LOT buys appear to be the least expensive response alternative. However, there are some hidden pitfalls, especially if the system might have an extended service life. Operation tempo changes constantly, so usage will fluctuate from year to year. The number of platforms in service changes over time, so that if a program manager buys 20 years of inventory stock and then the number of active platforms is halved, he suddenly has 40 years of stock on hand. Also, the system may be redesigned, upgraded, or replaced sometime during that 20-year service life; and remaining inventory is rendered as excess. Costs pertaining to LOT buys need to address a number of factors including: Inventory Holding Cost, Cost of Capital Tied Up in Inventory, Warehousing, Material Handling, Insurance/Taxes on Inventory, Counting/Auditing Inventory, Cost of Reporting, Cost of Spoilage, Damage, and Pilferage. Companies typically have a factor used to cover the above costs, called an “inventory holding cost factor”, usually expressed as a percentage of the dollar value of the inventory. This factor can range from 10% to 30%.

MASIS System Development

The Assistant Deputy Minister, Defense Information Services is developing the MASIS system to replace the current Maintenance Management Information System (MMIS). MMIS is characterized by multiple “stove-pipe” systems that are generally not integrated, and that have significant redundancy of information.

MASIS is intended to be a common integrated end-to-end client/server information system that will address the broad spectrum of materiel acquisition and support (MA&S) requirements. MASIS will address the following areas: systems engineering, logistics support, equipment configuration, supply, maintenance, equipment performance measurement, technical data management, and design support. The goal is to utilize COTS products wherever possible. The specific MASIS objectives are to:

- Support Canadian Forces (CF) operational activities by optimizing equipment availability as well as reducing the associated support costs throughout the equipment life cycle.
- Define and implement a common suite of integrated applications to support activities within the MA&S framework.
- Provide an alternate to the proliferation of "stove-pipe" information applications and systems within the MA&S communities.
- Provide an information system that satisfies the functional requirements as defined in the evolving MA&S Requirements Repository (MASRR).

Remarks

The Common Avionics EPM may want to evaluate use of the indentured system now used by the USAF Common Avionics System Program Office at Warner Robins/Air Logistics Center, and by RTSC in Indianapolis, Indiana.

During discussions with PMO MASIS, it was suggested that the developers may want to consider evaluating incorporation of some of the DMSMS and performance-based, business case analysis programs (TACTRAC, AVCOM, TORA, TeAM, RAN, etc) used by DoD Service Activities. As part of the discussions on U.S. DMSMS practices, and of potentially useful recommendations for evaluation by DND, the reader may want to review all the site visit trip reports.

NATIBO / DMSMS Site Visit Report

Organization Department of National Defence (DND) Air Equipment Program Manager (EPM) Office

Location 400 Cumberland Drive, Ottawa, Ontario, CANADA

Point-of-Contact Maj. G. Dennis Clark, Americas Team/International and Industry Programs (DGIIP), (613) 996-7153, af718@issc.debbs.ndhq.dnd.ca

Date Visited 17 October, 2000

Site Mission The Air EPM Office is responsible for procurement, sustainment, and upgrades of all DND airborne platform systems. This includes fixed wing aircraft (fighter, cargo, trainer), helicopters, and missiles.

DMSMS Practices Of the four EPM offices (air, maritime, land, common equipment), only the Air EPM was visited. The meeting included a briefing on DoD DMSMS practices, discussion of potential collaborative projects based on the completed U.S. site visits, and discussions about the DND CH-146 Griffon helicopter Contractor Logistics Support Program.

CH-146 Griffon Contractor Logistics Support Program

This Major Crown Project was established to acquire 100 Bell-412 helicopters. Designated as the CH-146, Griffon, CFUTTH helicopter replaced the CH-118 Iroquois, the CH-135 Twin Huey and the CH-136 Kiowa. The helicopters are used in three areas of operations: as part of the Special Emergency Response Team; in base rescue; and for tactical transport requirements. They are located at nine locations throughout Canada and have been deployed in numerous operations, such as Haiti, Honduras, Kosovo and presently Bosnia. Because the CH-146 was a fast track procurement project with numerous fleets involved in the replacement program, a cost comparison analysis was not carried out. However, DND has realized the following empirical benefits:

- One-stop shopping
- No cataloguing
- Reduction of initial povisioning
- Access to re-conditioned spares
- Short inventory and procurement lead times
- Negotiated long-term contract spares support
- Buy back of excess and obsolete spares
- Warranty coverage
- Advance payment to take advantage of additional discounts.

The Contractor's inventory system, Customer On-Line Ordering Processing (CO-OP), has been established at all CH-146 Squadrons and administration locations and is operated by DND trained personnel. They have visibility to Bell's four main Supply Centers (Fort Worth, Calgary, Amsterdam and Singapore). These personnel perform all aspects of inventory management such as spares acquisition, warehousing, stocktaking, shipping, receiving, etc. The Contractor is responsible for the maintenance of the communication lines at each of these locations excluding deployed operations. The system operates on a 24-7 time frame.

A 30-day supply of consumable, DND procured, spares are held at each Squadron. Automatic Min-Max replenishment has been established against these consumables. The levels are reviewed annually, subjected to joint DND/Contractor agreement, and are adjusted as required. A pool of repairable and time life spares has been procured and warehoused and inventory managed by Bell Helicopter at their Calgary Supply Center. These practices have eliminated first and second line held repairables. Due to direct shipment from the Contractor to the end user, they by-pass second line supply, third line depots and second line Central Materiel Traffic Terminals (CMTT). This greatly improves delivery service.

A negotiated level of service uses three priority codes, AOG/A99 (aircraft on ground, ship within 24 hours), B99 (work stoppage, ship within seven days), and 999 (routine stock replenishment, ship within 30 days). There are no negotiated penalties or incentives if delivery performance is not achieved. The average delivery performance for spares shipped within the required date is 72% for AOGs, 83% for B99, and 95% for 999s.

An annual review of Standard Hardware usage is carried out to enable DND to submit a consolidated requirement to the Contractor. The Contractor then offers this requirement as a best bulk price, thus eliminating the high mark-up on these type of spares. Pre-approved purchases of $C5K and under are part of the agreement while over $C5K requires Government approval. Administration costs are reduced by the payment of a monthly statement rather than individual invoices.

The repair and overhaul contract has proven extremely beneficial to DND. DND has one contract in place with Bell, who in turn has negotiated all the necessary terms and conditions with approximately 40 subcontractors to carry out the required repairs and or overhaul in accordance with Transport Canada/FAA regulations and standards. The repair line is always open, and DND does not have to hold spares in repairable reserve. Bell

manages these sub contractors. In most cases they have negotiated a Turn-Around-Time (TAT) of 30 days which is a vast improvement from previous repair and overhaul contracts with contractors in support of the replacement fleets. By having Bell as the prime contractor and TC/FAA Technical Inspector, DND eliminated providing Government Furnished Overhaul and Accountable Advance spares and Technical Service Divisions. A biweekly statement is submitted for payment rather than individual invoices. Pre approved repair of work up to 60% of the maximum repair cost of the item also reduces administrative work.

The lessons learned from this program involve the pricing formula of CH-146 unique equipment. Bell's pricing is very aggressive in this area. DND is trying to establish a pricing mechanism where by it would be cost effective continuing to support these items through CO-OP. Engine spares are procured through the engine supplier, Pratt and Whitney, by means of a National Individual Standing Offer. These spares are inventory managed through CO-OP. These practices cause DND some concern in that CO-OP technical and historical data is not always up to date.

Further projects with Bell, in support of the CH-146, are to have a Computer Base Training program, to have all related publications electronically managed and interfaced with CBT, and to have them perform Configuration Management and Software Support.

Remarks

The DND Air Equipment Program Manager may want to evaluate the TACTRAC parts analysis tool for use with its CF-18 program. There are several DoD DMSMS practices that were of interest to Air EPM: NAVAIR Aging Aircraft Program's synergy with the CF-18, NAVSUP's ALQ-126B redesign program, use of GIDEP's Shared Data Warehouse, as well as TACTRAC and AVCOM commercial parts analysis tools, and DoD's organic low volume production facilities.

NATIBO / DMSMS Site Visit Report

Organization	Canadian Commercial Corporation
Location	50 O'Connor Street, Suite 1100, Ottawa, Ontario, CANADA
Point-of-Contact	Joe Yagminas, Industrial Base Program Manager, (613) 995-7706, joe@ccc.ca Glen Nichols, Director CCC, (613) 947-1170, glen@ccc.ca
Date Visited	18 October, 2000
Site Mission	Canadian Commercial Corporation (CCC) is an export sales agency, wholly owned by the government of Canada. CCC serves Canadian exporters, assists foreign buyers, issues government backed contract guarantees, and assists in U. S. government sales. CCC's government backed guarantee of contract performance often results in Canadian exporters enjoying more favorable terms, including the waiving of performance bonds, arranging advanced payments and better project terms. CCC is responsible for maintaining the Canada/U.S. Defense Production Sharing Arrangement. When selling products and services in excess of $100K to DoD, Canadian companies do so exclusively through CCC. CCC is a member of the NATIBO.
DMSMS Practices	CCC is neither a provider nor user of DMSMS practices directly. They are indirectly involved with DMSMS issues as part of their government backed performance guarantees of Canadian contractors working on DoD contracts.
Remarks	The purpose of this site visit was to make U.S. Service Activities aware of CCC and its capabilities. CCC's Web Site is www.ccc.ca

NATIBO / DMSMS Site Visit Report

Organization	Computing Devices Canada (CDC) Ltd., Systems Integration Division (Iris Communications System OEM)
Location	1020 68th Avenue, Calgary, Alberta, CANADA
Point-of-Contact	Jim Mason, VP Engineering and Chief Technologist, (403) 295-5402, jim.mason@cdgy.com Vic Rosbek, Senior Component Engineer, (403) 730-1219 Vic.rosbek@cdcgy.com
Date Visited	19 October, 2000
Site Mission	CDC, owned by General Dynamics Company, is a manufacturer of Communications/Command and Control systems, Air/Vehicle/Ship Tactical Display Systems, Digital Fire Control Systems, Tactical Biological-chemical Systems, Acoustic Systems, and Multi-sensor Reconnaissance Systems. CDC is the developer for the newest DND communications system, Iris.
DMSMS Practices	CDC has won the largest communications contract in DND history to develop the Iris System for the Canadian Army. The Iris system consists of a local area system, a wide area system, a mobile system, a messaging system, and a management and control system. With over 1300 different configurations of hardware in 150 different types of vehicles, the Iris Communications System is the world's first fully integrated and secure, voice and data network. In 1992, CDC proposed a system design for a Total Contractor Performance Responsibility product for which CDC had complete configuration control and performance warrantee responsibility. The prototype systems delivered in the summer 2000, have been built with contractor logistics support in mind. DND is currently evaluating whether to award a 20 year sustainment guarantee contract to CDC. The Iris System contains approximately 65% commercial parts. During development and field tests of the prototype systems, CDC used both TACTRAC and GIDEP parts databases. TACTRAC is a commercial electronic part analysis tool from i2 Technologies Inc. GIDEP is a military specification and commercial parts information center (see Site Visit Trip Report).

TACTRAC performs a number of functions. It offers an assessment of a real-time library of semiconductors offered by all worldwide manufacturers. It projects component technology life cycles to reduce premature obsolescence. It automates indentured configuration management by identifying where components are used within the subject system, and across other subscriber systems. It offers obsolescence "Health Model" projection of components, modules, circuit card assemblies, and whole systems. CDC used both TACTRAC and GIDEP part data, along with their own in-house parts indentured analysis tool, to analyze the various resolution solutions to DMSMS problems.

From a "lessons learned" standpoint, CDC regrets that it accepted hardware description "B" specifications in the contract, instead of a more contractor- logistics-support friendly top-level system performance "A" specifications. For example, the "B" specifications forced them to use older Intel 286 processor technology. CDC will try to change to "A" specifications if they win the follow-on full production/sustainment contract.

As a result of their efforts on the Iris System, the United Kingdom Ministry of Defense has requested a CDC proposal for the British "Bowman" Communication System.

Remarks

Performance based support contracts are fairly recent events; having been introduced only since the early-1990's. Both DND and DoD have performance-based contracts for both on-going and new systems. The feasibility of joint meetings between DoD and DND program managers could be scheduled to discuss management practices, metrics, and lessons learned, at the next NATIBO executive meeting and/or at the next DMSMS Conference. A sample listing of weapon systems that might be discussed, follows:

CH-146 / Griffon Helicopter	C-17 & V-22 Jet Engine
DD-21 Land Attack Destroyer	Iris Communication System
TF-39, T-56, F100 Engine Repair	T-45 Secondary Trainer
CH-124 Sea King Helicopter	JDAM & JASSM Missiles
UCAV Drone	CT-155 Hawk Trainer Acft
C-130J & C-130AMP Avionics	Joint Strike Fighter
CT-156 Harvard II Trainer	Adv Amphibious Assault Vehicle

CDC engineers were pleased with the GIDEP commercial part database, but were less enthusiastic about trying to use TACTRAC for commercial parts.

NATIBO / DMSMS Site Visit Report

Organization	Harris Canada Ltd., Aerospace Canada Division
Location	6732 8th Street N.E., Calgary, Alberta, CANADA
Point-of-Contact	Bob Mischler, Logistics Manager, (403) 295-4773, bmischle@harris.com Robert Fehr, Senior Operations Manager, (403) 295-5011, rfehr@harris.com
Date Visited	19 October, 2000
Site Mission	Harris Canada, Inc. has two divisions in Calgary: the Wireless Access Division, and the much smaller Aerospace Canada Division. The Wireless Access Division specializes in the design, manufacture, installation and support of wireless telecommunication networks for global markets. The Aerospace Canada Division was awarded a ten year, $C164M, DND contract in 1999. The contract established the CF-18 Consolidated Automatic Test Equipment Facility (CATEF) at Harris to conduct test and repair of CF-18 avionics. The contract includes spares management, obsolescence management and provision of additional test equipment. A portion of the work was subcontracted to Raytheon Systems Canada Ltd., also in Calgary (separate trip report).
DMSMS Practices	Due to DND budget cutbacks forcing reductions to its organic maintenance personnel, Harris Canada was awarded a 10 year alternative system delivery contract (similar to a DoD contractor logistics support contract) to repair selected CF-18 avionics from its single location in Calgary, instead of at the previous two CF-18 bases. This contract was the second contractor logistics support effort for DND (the first was the CH-146/Bell 412 helicopter, separate site visit trip report). This contract also is unusual for the way in which it is structured. Initially, it's a level-of-effort (Harris)/sustaining (Raytheon) contract which reverts to a firm fixed price contract in July 2002. Harris is provided an initial inventory of spare parts out of the DND supply warehouse after which Harris is responsible for spares procurement. Spares are initially Government funded but are to transition to Contractor funded in 2002. Also noteworthy, Harris is using Canadian commercial courier service (Loomis) for the delivery of avionics, instead of depending upon DND organic logistics infrastructure. Harris is the prime contractor with Raytheon Systems Canada (separate site visit trip report) as its only subcontractor at the time of the site visit. Harris supports the majority of the circuit cards in

the CF-18 and will support 17 non-core avionics boxes in the Spring 2001. Raytheon repairs the CF-18 APG-65 radar sub-assemblies. Eventually, Harris will manage up to six other CF-18 avionics and automatic test equipment subcontractors. DND retains avionics configuration management as well as DMSMS/ obsolescence management via the Common Avionics Equipment Program Manager Office (separate site visit trip report). The GIDEP database is used exclusively.

Harris has performance metrics on its avionics contract:

- Circuit Card Assemblies must be available at the 1st line Window 95% of the time
- Priority Demands must be satisfied in 1 day
- Less than 5% Installation Failures for each equipment type
- No equipment damage due to shipping and handling

The automatic test equipment that Harris uses for repair is the responsibility of Harris, although final technical approval of change requirements still rests with DND. Harris has all four of DND's Hybrid Test Stations (HTS) in house. Harris is responsible for engineering support, operation and maintenance, obsolescence management, configuration management, and will shortly assume life cycle material management of these stations. Raytheon has three of the six DND Radar Test Stations (RTSs) in their facility three blocks away. The first Automated Test Station (ATS) is due into Harris in April, 2001. By summer 2002, Harris and Raytheon will obtain all of the Canadian Forces ATS and RTS stations and assume the same responsibilities that exist with the HTS.

DND approved a Harris HTS DMSMS Plan in August, 2000, initiating Harris's responsibility for HTS DMS/obsolescence responsibility. The Harris plan involves the identification of HTS components at risk of becoming obsolete and initiating a contract with an obsolescence service provider through a competitive bid process to perform the monitoring of these items for active procurement sources.

The obsolescence service provider services will afford a far more proactive approach in keeping the test equipment operational. Harris also is pursuing performing avionics obsolescence management functions through DND. This is required to meet part availability requirements. In "lessons learned" discussions, Harris has been seriously challenged to meet their 95% Window availability metric due to unidentified obsolete parts and current GIDEP-based reactive practices. Harris is pushing for increased obsolescence information sharing between Canadian, US, and international F-18 users.

Harris has consistently exceeded the 95% availability requirement since assuming full item management responsibility for the selected CF-18 avionics in April, 2000.

Remarks

Because the NAVAIR Aging Aircraft Program Office has an existing proactive DMSMS program for U.S. F-18 avionics (separate site visit trip report), it might be useful for DND and/or Harris to evaluate the NAVAIR program.

NATIBO / DMSMS Site Visit Report

Organization Raytheon Systems Canada, Ltd., Calgary Electronics Facility

Location 919 72nd Avenue N.E., Calgary, Alberta, CANADA

Point-of-Contact Eric Harrison, Assistant General Manager, (403) 295-6903, erharrison@raytheon-ssd.com

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Date Visited 20 October, 2000

Site Mission The Calgary Electronics Facility (CEF) is the headquarters for Raytheon Systems Canada's Services and Support Division. CEF is involved in three DND activities: they provide repair, overhaul, and technical support for the CF-18 APG-65 radar CATEF, for the Canadian Patrol Frigate's Phalanx gun system, as well as Integrated Logistics Support Services. The CEF is certified to ISO 9001-94, with a modern, environmentally controlled laboratory outfitted with top-of-the-line test equipment. Integrated Logistic Support Services group provides conventional and interactive electronic technical manuals, configuration management, data management and training.

DMSMS Practices CEF:

- Depot level repair and overhaul of the APG-65 Radar System
- Spares procurement
- Test systems hardware and software design, development and production
- Test Program Set development for complex electronic systems
- Retrofit modification engineering
- Modification kit production and installation
- Radar Technical Investigations and Engineering Studies
- Mobile Repair Parties
- Electronic circuit design, test and manufacturing using the latest microcircuit technologies
- Microminiature repair of circuit card assemblies and sub-assemblies

Raytheon CEF has DMSMS practices advantages that its prime CATEF contractor, Harris, does not: Raytheon is the supplier of the APG-65 radar, and has a sister U.S. company, RTSC/ Indianapolis, that is responsible for NAVAIR DMSMS activities. Raytheon CEF has placed Raytheon RTSC on contract to provide it with DMSMS services. CEF uses the RTSC/NAVSEA DMS

Center (Crane) RAN to supplement normal DND supplied GIDEP alerts. CEF mentioned that they get ten RAN notices for every GIDEP notice. They also use RTSC's TACTRAC part analysis tool, as well as in-house Raytheon tools.

TACTRAC

CEF is using a commercial electronic part analysis tool, TACTRAC, along with in-house parts indentured analysis tool, to analyze the various resolution solutions to DMSMS problems. TACTRAC performs a number of functions. It offers an assessment of a real-time library of semiconductors offered by all worldwide manufacturers. It projects component technology life cycles to reduce premature obsolescence. It automates indentured configuration management by identifying where components are used within the subject system, and across other subscriber systems. It offers obsolescence "Health Model" projection of components, modules, circuit card assemblies, and whole systems.

Enhanced Automated Graphical Logistics Environment (EAGLE)

EAGLE is an integrated database system designed to provide real-time solutions for automating logistics, provisioning, and technical publication tasks. EAGLE consists of software tools, both Raytheon and third party COTS, that provide users with an innovative and powerful logistics database application optimized for the Windows operating environment. It is the only commercially available system that can automatically produce technical manuals from a logistics database, Interactive Electronic Technical Manual (IETM), and Hypertext Markup Language (HTML) output for publication over the World Wide Web. Additionally, EAGLE provides the ability to access and mark up engineering drawings and illustrations, and the database can be completely deployed in the field using a notebook computer.

Advanced Integrated Maintenance Support System (AIMSS)

Raytheon is recognized as one of the leaders in the conceptual and practical application of IETM technology products. AIMSS, Raytheon's interactive authoring tool, was produced based on 15 years of research and development in the field of electronic presentation and interactive maintenance information. IETM technology provides a means to efficiently manage and use information without the disadvantages of paper volumes.

Material and Asset System (MAMS)

MAMS is an Oracle database system designed to track and record any and all work within RCSSD. In addition, MAMS tracks the entire overhaul and repair process from initial contract award to completion and final payment for the contract. Recently, there have been several modules added to MAMS; MAMS tracks the availability, whereabouts and repair times of each of the

replaceable assets within the CATEF and also controls the distribution of these within the CATEF. Other additions to MAMS and its functionality are under development; these include additions to the configuration management functions, proposal tracking and an interface with the EAGLE logistics software.

Raytheon CEF is responsible for meeting the CATEF performance metrics as well (see Harris site visit trip report). They have been tasked to get CF-18 parts for both their APG-65 radar repair as well as for Harris's non-core avionics repair. They also are responsible for radar test equipment.

When DND starts its CF-18 Upgrade Program in FY2001, in which they will modify the F-18 model A/B APG-65 radar to the newer APG-73 radar, Raytheon CEF will upgrade the test equipment.

The standard reactive DMSMS practice is LOT buys. Raytheon CEF is initially using up APG-63 DND Supply parts as part of the CATEF contract. CEF has already bought LOT buy APG-73 parts from its sister Raytheon El Seguondo production facility.

Remarks

Raytheon CEF has access to better than typical DMSMS assets. If DND decides to implement proactive DMSMS practices, CEF's contacts at RTSC and NAVSEA/Crane will ease the transition.

NATIBO
DMSMS Study
Points of Contact List

In accordance with the newly implemented OSD website security procedures, information regarding Points of Contact has been removed. In you need point of contact information, send an Email to AMSAA-NATIBO@ria.army.mil. Provide your name, organization, and phone number. A NATIBO representative will contact you with a response to your specific request.

Acronyms

Acronyms

AAIPT	Aging Aircraft Integrated Product Team
AFB	Air Force Base
AFRL	Air Force Research Laboratory
AIMSS	Advanced Integrated Maintenance Support System
ALC	Air Logistic Centers
AMCOM	U.S. Army Aviation & Missile Command
API	Application Programs Indenture
ASIC	Application Specific Integrated Circuits
AVCOM	Avionics Component Obsolescence Management
AVPRO	Avionics Production
BCA	Business Case Analysis
CATEF	Consolidated Automated Test Equipment Facility
CCA	Circuit Card Assembly
CCC	Canadian Commercial Corporation
CECOM	U.S. Army Communications & Electronics Command
CEF	Calgary Electronics Facility
CF	Canadian Forces
COTS	Commercial-Off-The-Shelf
CY	Calendar Year
DESC	Defense Electronics Supply Center
DLA	Defense Logistics Agency
DMEA	Defense Microelectronics Activity
DMSMS	Diminishing Manufacturing Sources and Material Shortages
DND	Department of National Defence
DoD	Department of Defense
DSCC	Defense Supply Center Columbus
DTC	DMS Technology Center
EAGLE	Enhanced Automated Graphical Logistics Environment
EAPF	Electronics Analysis and Prototyping Facility
ECPG	Electronic Combat Product Group
ECTA	Electronic Component Technology Assessment
EPM	Equipment Program Manager
EPOI	Electronic Parts Obsolescence Initiative
F^3I	Form, Fit, Function Interface
FMS	Foreign Military Sales
FY	Fiscal Year
GIDEP	Government Industry Data Exchange Program
HMA	Hybrid Microelectronics Assemblies
HTS	Hybrid Test Stations
IETM	Interactive Electronic Technical Manual
IHS	Information Handling Services

JASSM	Joint Air-to-Surface Missile
LOT	Life-of-Type
LRU	Line Replaceable Units
MA&S	Materiel Acquisition and Support
MAMS	Material and Assessment System
MASIS	Material Acquisition and Support Information System
MLRS	Multiple Launch Rocket System
MMIS	Maintenance Management Information System
MTI	Manufacturing Technologies, Inc
NATIBO	North American Technology and Industrial Base Organization
NAVAIR	Naval Aircraft Systems Command
NAVSEA	Naval Sea Systems Command
NAVSUP	Naval Supply System Command
NLP	Naval Logistics Productivity
NSN	National Stock Number
NSWC	Naval Surface Warfare Center
NUWC	Naval Undersea Warfare Center
O&S	Operation and Support
OC/ALC	Oklahoma City Air Logistics Center
OEM	Original Equipment Manufacturer
PAC-3	Patriot Program Office
PoF	Physics of Failure
R&D	Research and Development
RAN	Rapid Alert Notification
RDEC	Research, Development & Engineering Center
RTSC	Raytheon Technical Services Company
SAF	Safety and Arming Fuse
SPO	System Program Office
SWEF	Surface Warfare Engineering Facility
TACTRAC	Transition Analysis of Component Technology
TeAM	Technology Assessment and Management
TORA	Technology Obsolescence Risk Assessment
USAF	United States Air Force
VHDL	Hardware Design Language
VHSIC	Very High Speed Integrated Circuit
WR/ALC	Warner Robins Air Logistics Center