Defense Standardization Program

Journal

October/December 2005

The Program Manager

Program Managers Tool
Knowledge Management
The Weapon System Impact Tool

Defense Standardization Program
Journal

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Gregory E. Saunders
Director, Defense Standardization Program Office

Timothy P. Koczanski
Editor, Defense Standardization Program Journal

Defense Standardization Program Office
8725 John J. Kingman Road
Stop 6233
Fort Belvoir, VA 22060-6221

703-767-6870
Fax 703-767-6876

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"The Buck Stops Here"

President Harry S. Truman kept a sign on his desk to remind himself and others that the tough decisions and the final responsibility for those decisions were his. When it comes to weapon system acquisition programs, the buck stops where the program manager (PM) sits. A PM holds one of the most challenging and difficult positions in the Department of Defense.

The program manager's responsibilities include planning, organizing, directing, and coordinating program activities to meet cost, schedule, and performance requirements for a weapon system. That means also reacting to news stories, budget uncertainty, schedule stretch-outs, congressional questioning, multiple layers of oversight, and so on—all in the very public eye. The PM's roles and responsibilities have changed over the years, and those changes have influenced how PMs have applied standardization on their programs.

Prior to Acquisition Reform, a program manager's responsibilities began early in concept development and ended when the system was fielded. Today, a PM has total life-cycle responsibility—cradle to grave—for the system. Previously, the PM's primary concerns were for cost, schedule, and performance. Now the PM has the added responsibilities for total life-cycle cost and logistics support, an important difference because post-fielding logistics support accounts for about 80 percent of a system's life-cycle cost.

When the PMs' cost focus was on controlling or achieving the acquisition cost objectives for the delivered system, they often viewed standardization as a constraint on their ability to innovate and control costs. This view was reinforced by the rigid and prescriptive way DoD imposed parts management and standardization disciplines on programs. This approach helped obscure a PM's understanding of how standardization can be an important tool in helping to achieve cost, schedule, and performance objectives. Further, standardization payoffs are most frequently long-term efficiencies and savings for the corporate entity rather than for a particular program. In the post-Acquisition Reform period, the value of standardization remained in the shadow of obscurity. With little incentive and no direction to standardize, standardization, for some, shifted

Gregory E. Saunders
Director, Defense Standardization Program Office

from being a constraint to being irrelevant. It may be that failures from lack of standardization were the only way to bring standardization back into the light. Its emergence from the dark is in part due to its powerful role in helping to control costs in the logistics support phase and the fact that the PM is now responsible for that phase.

Standardization helps to reduce costs by reducing the number of different parts that must be managed to support a system, thus shrinking the system's logistics footprint. Consolidating demand in fewer part numbers increases DoD's unit cost leverage through economies of scale.

Standardization influences schedule by shortening design and testing times through the use of readily available, documented, and proven parts and components. The same principle applies to standardized use of common high-level systems and equipment across different platforms and military services. Standardization also supports rapid spiral development by enabling faster and easier technology insertion and refreshment. This concept is nicely demonstrated in a Defense Standardization Program (DSP) case study, *Acoustic-Rapid Commercial Off-the-Shelf Insertion*, available through the DSP website or by contacting this office.

Standardization influences performance in several ways. Interoperability is a key performance parameter in every new system or major modification, and interoperability, a characteristic of design, may be achieved only through standardization. For two or more functions or items to interoperate, they must have in common the standard enabling interfaces or technologies. Whenever a PM has interoperability requirements, standardization is part of the solution.

Standardization increases availability by providing proven high-reliability parts. And, it helps to minimize diminishing manufacturing sources and materiel shortage issues by consolidating demand volume in fewer part numbers from stable and qualified sources.

It is important for us to remember that the principal use of our standardization documents is to support the acquisition system that puts equipment in the hands of our warfighters. Having great documents is irrelevant if the program manager doesn't know what documents are available, where to get them, or when to use them. It is incumbent on the standardization community to bridge this gap—to provide the right information at the right place and right time to make the decisions that enable PMs to meet their cost, schedule, and performance objectives. Essential technical knowledge and lessons learned stored in specifications and standards are made available through ASSIST—Acquisition Streamlining and Standardization Information System. Through the Program Managers Tool, the DSP gives PMs ready access to knowledge about the international standardization agreements that apply to their programs. The Weapon System Impact Tool mines the knowledge hidden in numerous diverse data sources to help PMs understand the nexus between materiel specifications and standards and the weapon systems that use them. Our SD-21, *Listing of Specifications and Standards Mandated for use by Public Law or Government Regulations*, alerts program offices to standards that are mandated for use.

Being a program manager is not easy. PMs often face impossible demands, congressional inquiries, endless reviews, and uncertain funding streams, and they have to do it all in a fishbowl environment. Program managers deserve all the assistance that we can possibly provide. Today, as we have for the past 53 years, the DSP stands ready to give PMs all the help at our command. It is for you, first and foremost, that we exist. I dedicate this issue of the *Defense Standardization Program Journal* to all PMs past, present, and future.

Program Managers Tool

A Pathway to Interoperability and Lower Life-Cycle Cost

By Ron Zabielski

Interoperability is essential to the effectiveness of joint and multinational operations, both in warfare and in military operations other than war. For decades, DoD and the military services have labored long and hard to identify opportunities to improve interoperability with our multinational alliance partners (NATO and others). The results of these efforts are international standardization agreements (ISAs) that, when ratified by the United States, are to be implemented, where applicable, by program managers (PMs) on their weapon system programs.[1]

For several reasons, implementing these ISAs has proven difficult, if not impossible, for most PMs. Until recently, no central repository or database contained the ISAs. Moreover, the agreements were available only in hard-copy documents; no accessible digital versions of the documents were available. In addition, many PMs were unaware of their obligations to implement the agreements. And if they were aware, they had no viable way to determine where the agreements resided or which ISAs were relevant to their programs. As a result, progress toward implementing the ratified agreements was slow and difficult.

To help PMs perform their important mission requirement of implementing the ISAs on their weapon systems, the Defense Standardization Program Office (DSPO) developed the Program Managers Tool, or PMT.

What Is the PMT?

The PMT is a web-based pathway for accessing ISAs and selecting standards (other than those for information technology) needed to meet interoperability, logistics readiness, safety, and other operational needs.[2] The tool gives program managers and their program teams a new and powerful capability. DSPO identified the materiel-related ISAs and made them available electronically through the Acquisition Streamlining and Standardization Information System (ASSIST). The PMT enables the PM to access and use the ASSIST documents in powerful new ways.

In addition to ISAs, the PMT contains selected specifications and standards, from ASSIST, deemed essential and meeting one or more of the following criteria:

- Document is necessary to support DoD operational requirements to achieve a capability to accomplish approved military objectives, missions, or tasks.
- Document is needed to ensure interoperability for a family of systems, between systems, subsystems, or materiel within a service, among services, or with military treaty organization allies (excludes information interoperability as defined in the Joint Technical Architecture).
- Document is needed to meet goals of the Force-centric Logistics Enterprise (FLE) for enhanced readiness, reduced logistical footprints, complete supply chain visibility, improved transportation, or reduced and improved maintenance.
- Document is needed to ensure safety.

The PMT is the implementing tool for the Joint Materiel Standards Roadmap. The roadmap helps ensure that standards used by PMs continue to support the warfighters' operational requirements for interoperability and logistics, as articulated in the FLE. The objective of the roadmap is to reduce the number of standards to those required to support these objectives and to assist program managers with selecting and applying the appropriate standards.

Why Should a PM Use the PMT?

Using the PMT can help a PM comply with the obligation to implement the international standardization agreements, ratified by the United States, enabling greater interoperability with our international partners. Failure to implement these agreements may render the PM's weapon system unable to use support provided by international partners in time of war, thereby increasing the logistics burden that the PM must account for when the weapon system is deployed. The consequences might include lower system availability, inability to perform a mission, and even putting the lives of warfighters at increased risk.

Beyond the matter of interoperability, the PMT can help the PM achieve many of his or her program objectives. The PMT will enable the PM to identify preferred technical solutions faster and easier, helping to reduce development cycle time. Using proven technical solutions can help improve system reliability, reduce program risks, improve system readiness, and lower unit and life-cycle costs. The PMT can help PMs achieve greater commonality with other services and systems, reducing risks of diminishing manufacturing sources and materiel shortages, improving logistics readiness and parts management for the deployed system.

The PMT is designed around the work breakdown structure (WBS) described in MIL-HDBK-881. The WBS is used routinely by PMs and contractors doing development work for the government.

Because the ISAs, specifications, and standards contained in the PMT are mapped to the WBS, the PM can instantly target his search to a specific WBS code and then easily identify and obtain only those documents of interest. Today, the PM can accomplish in minutes that which previously took hours or days.

Accessing the PMT

Accessing the PMT requires the user to have an active ASSIST account. If you do not have an account, go to http://assist.daps.dla.mil to register for an ASSIST account.

If you are a DoD user with a ".mil" e-mail extension, when you log in to ASSIST, the PMT link will appear on the left-hand side menu. If it does not, then ASSIST does not

recognize you as a DoD user. If you are a DoD user without a ".mil" e-mail extension and still want to access the PMT (remember you must have an active ASSIST account first), go to https://pmt.daps.dla.mil/ and click the PMT Access Request form.

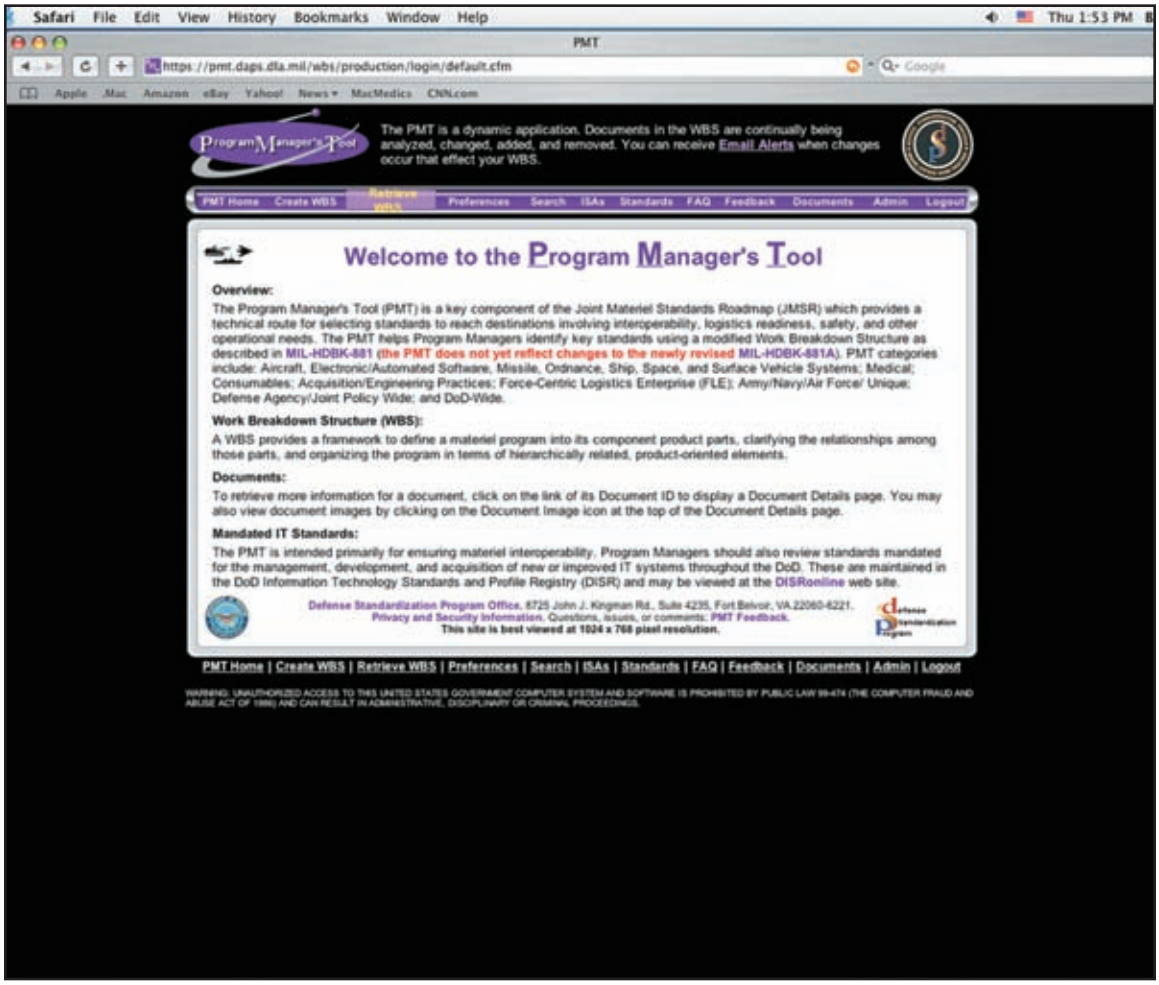
If you are a commercial user—a DoD weapon system developer or a support contractor—and wish to have access to the PMT, go to https://pmt.daps.dla.mil/ and click the PMT Access Request form. (Remember that you must have an active ASSIST account first.)

What Can a PM Do Using the PMT?

To help answer this question, we will explore the new capability by walking through a few of the PMT's user interface screens. This exercise is intended to provide only a simple example of some PMT capabilities and will not touch on a number of other PMT functions.

When you log in with an account code and password, the PMT home page will be displayed (Figure 1).

FIGURE 1.



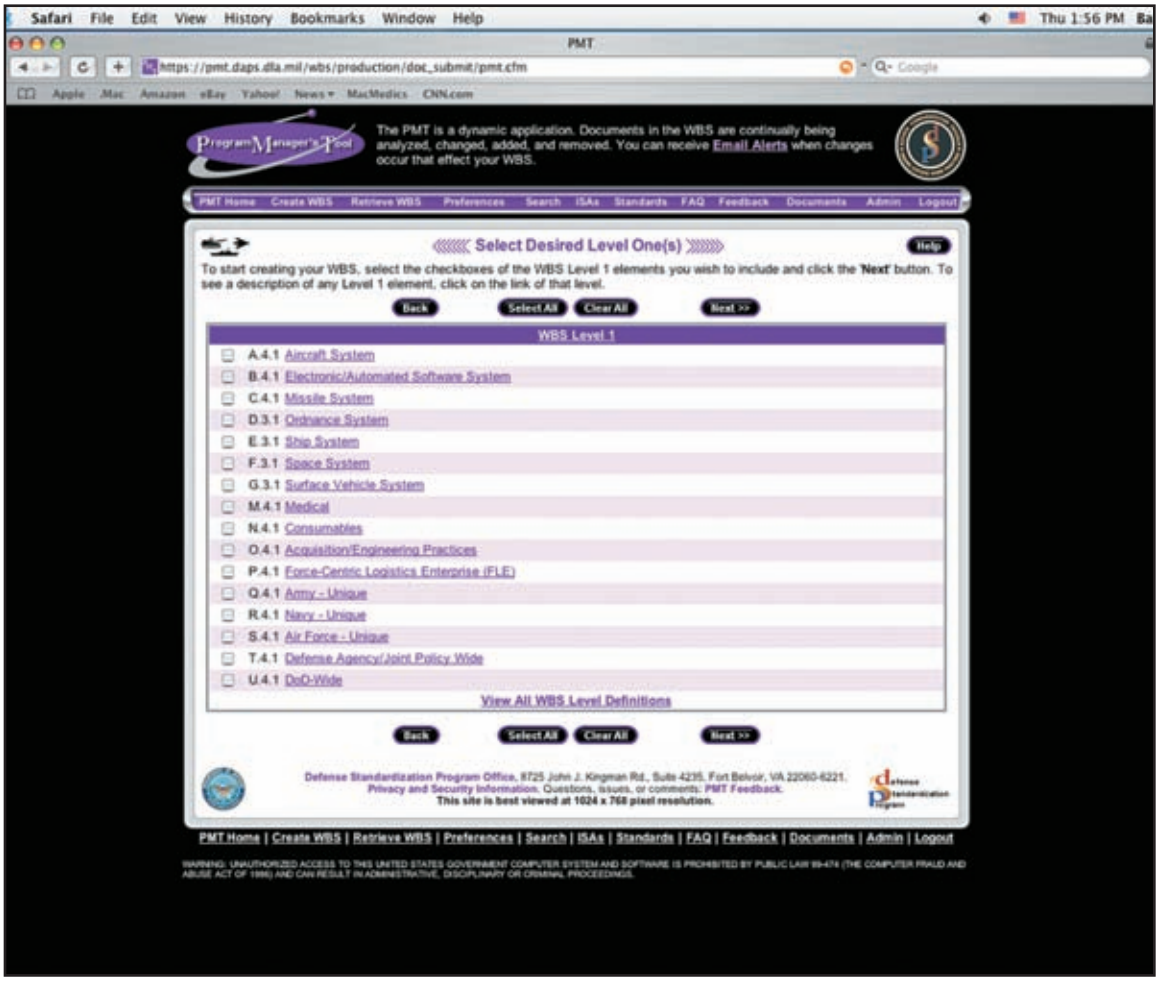
The menu bar, located just above "Welcome to the Program Manager's Tool," contains several options for using the tool, including the following:

- Create WBS
- Retrieve WBS
- Preferences
- Search
- Feedback.

Selecting "Create WBS" will allow the user to create a customized PMT query that can be saved and then used over and over again. Each time the custom query is used, it will retrieve the most current information.

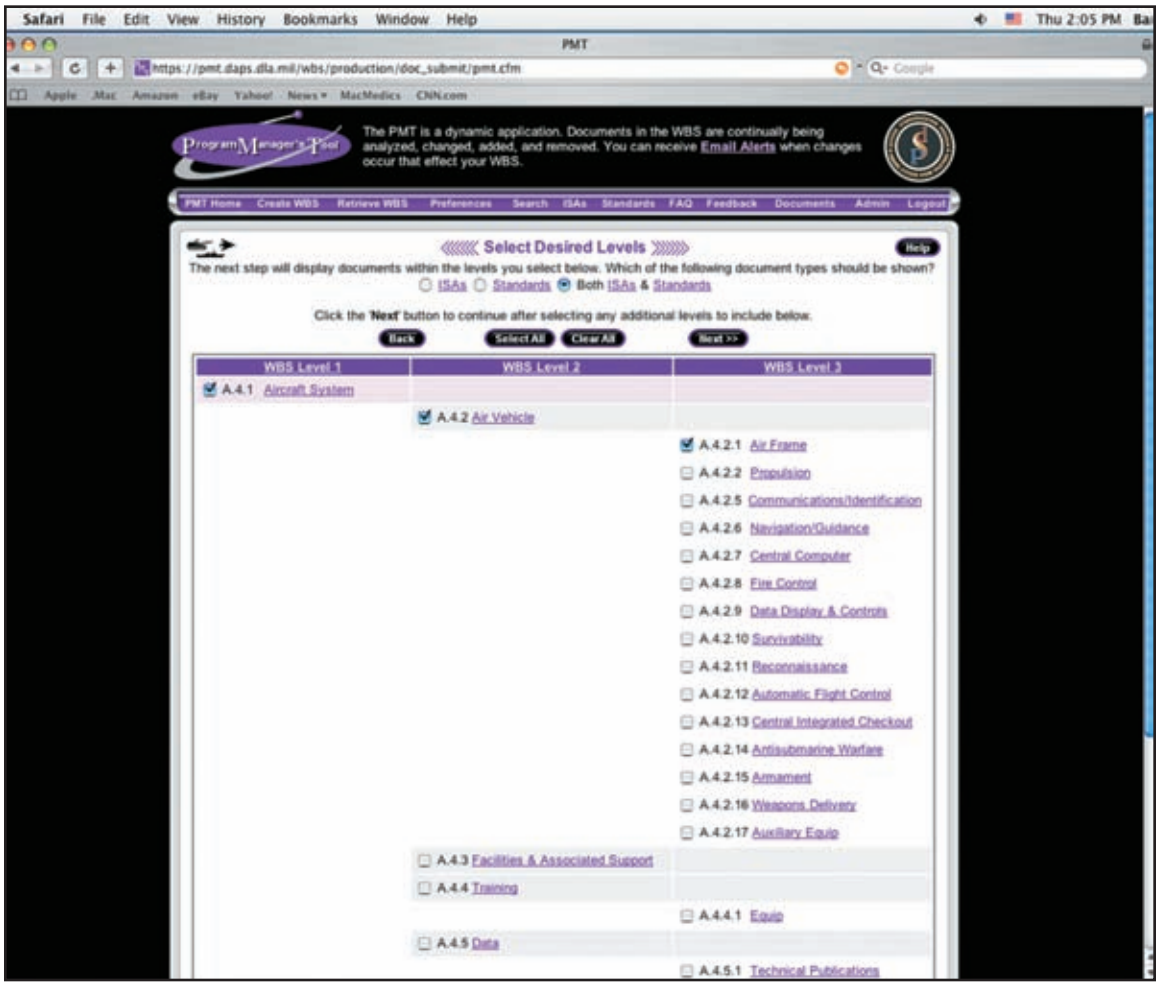
When the user selects "Create WBS," a screen containing the top-level WBS categories will appear (Figure 2).

FIGURE 2.



The user may select any or all of the categories, depending on the areas of interest. In this example, we selected "Aircraft System." This will retrieve and display the top three WBS levels for aircraft systems (Figure 3).

FIGURE 3.

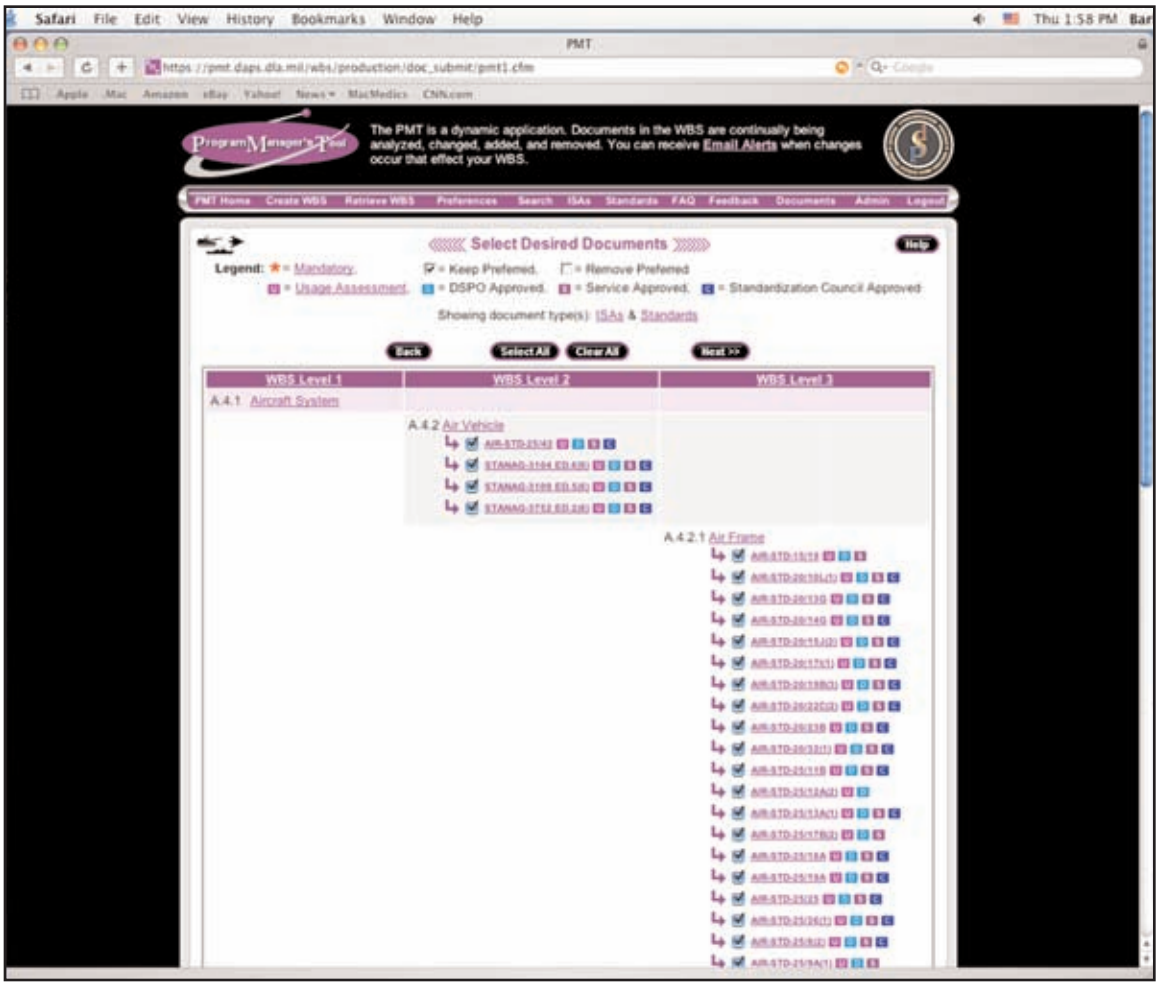


The user may now select from the lower WBS levels those areas of interest for the customized query. In this example, we selected only "Air Frame." Selecting a third-tier item will automatically select its second tier parent, "Air Vehicle." This will retrieve and display the ISAs that relate to the selected items (Figure 4).

The list may include NATO Standardization Agreements (STANAGs), as well as a number of other ISA document types such as Air Standards, Advisory Publications, and Information Publications. Those are agreements from the Air and Space Interoperability Council (previously known as the Air Standardization Coordinating Committee), which develops ISAs among the air forces of Australia, Canada, New Zealand, the United Kingdom, and the United States.

Had the user selected "Ground Vehicles" as the top WBS level, in addition to applicable STANAGs, he might see Quadripartite Standardization Agreements and Quadripartite Advisory Publications, which are agreements among the armies of the same five nations. By selecting "Ship System," the user might, in addition to the many applicable STANAGs, also see ISA documents from among the naval command, control, commu-

FIGURE 4.

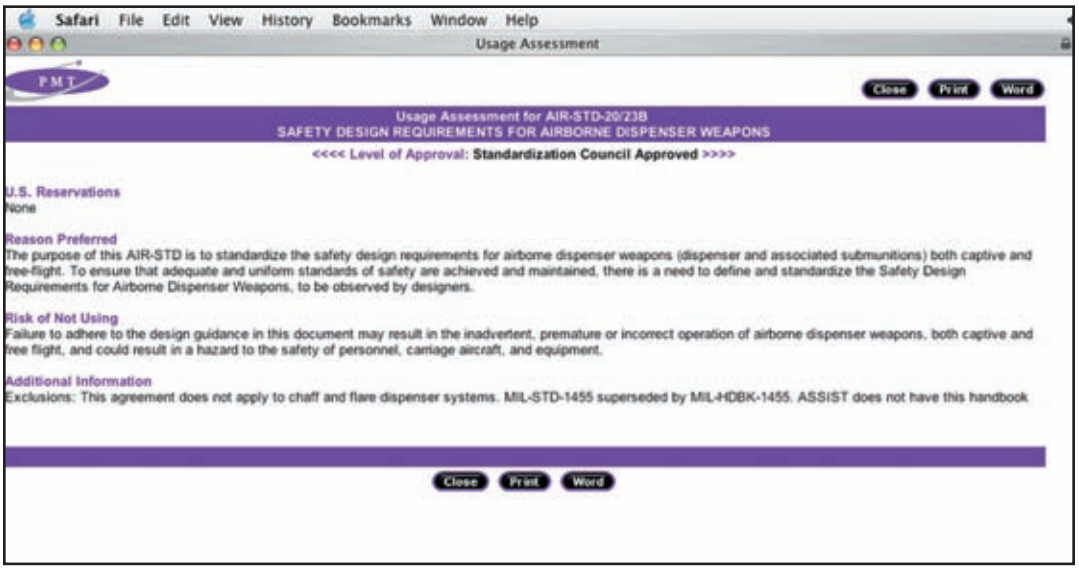


nications, and intelligence organizations of the five nations. Clearly, the PMT brings a wealth of information essential for interoperability to the users' fingertips.

A user can now select specific documents of interest to create a customized and reusable query. This is done by deselecting those documents in which the user has no interest by unchecking the boxes. The user can then save this customized query for later use and thereafter retrieve it at the click of a button by using the "Retrieve WBS" choice on the main menu. In the near future, the user will be able to order a CD with the created WBS and all of its implementing documents and have it mailed to the address associated with his ASSIST user account.

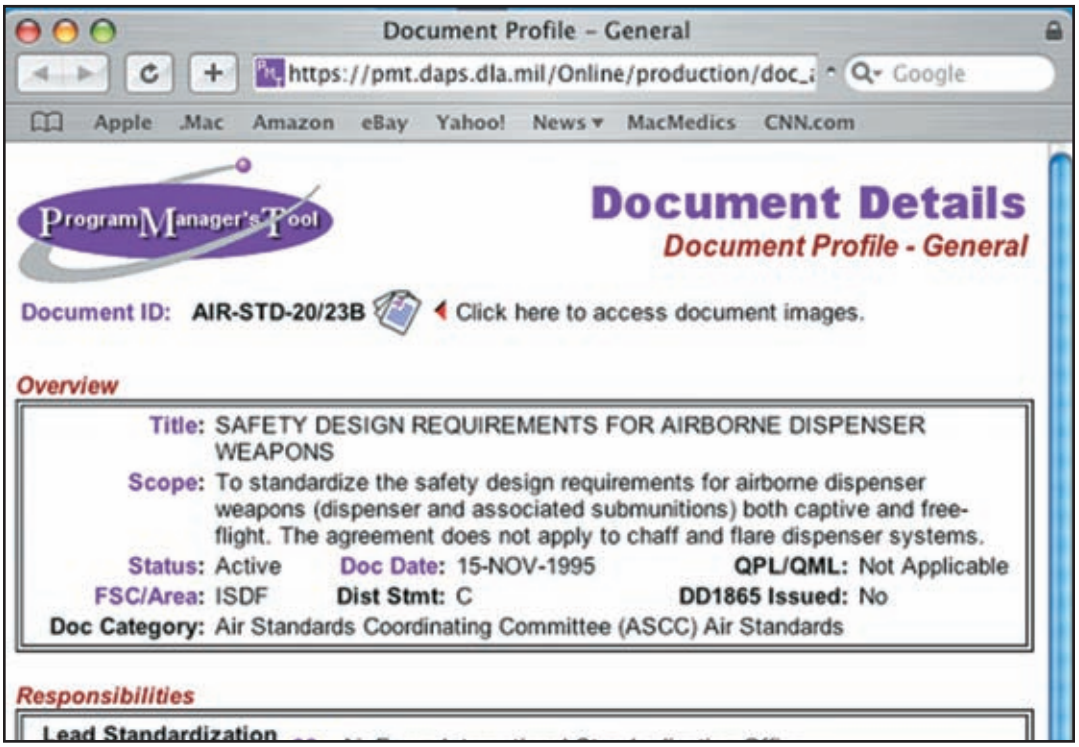
To further aid the user in making a determination of interest, he may click the first box to the right of the Document ID, marked with U, to see a usage assessment for the document. The usage assessment will inform the user of any U.S. reservations regarding the agreement. It will also describe why the document is preferred and should be used in the system design and what the risks might be if the document is not used, and it will provide the user with other information of importance regarding the document (Figure 5).

FIGURE 5.



Now that the user has a customized query list of the documents of interest, he may access much more information about the individual documents. By positioning the cursor over a listed Document ID, but not clicking the mouse, the MouseOver command feature of the PMT will display the document title, enabling the user to quickly see the subject matter of a document and to determine his level of interest. For any document in which he has an interest, clicking the Document ID will retrieve a detailed profile for the document (Figure 6).

FIGURE 6.



Scrolling down through the Document Details screen, the user will also find point-of-contact information, a list of the U.S. implementing documents for the agreement, and a list of other related documents (Figure 7).

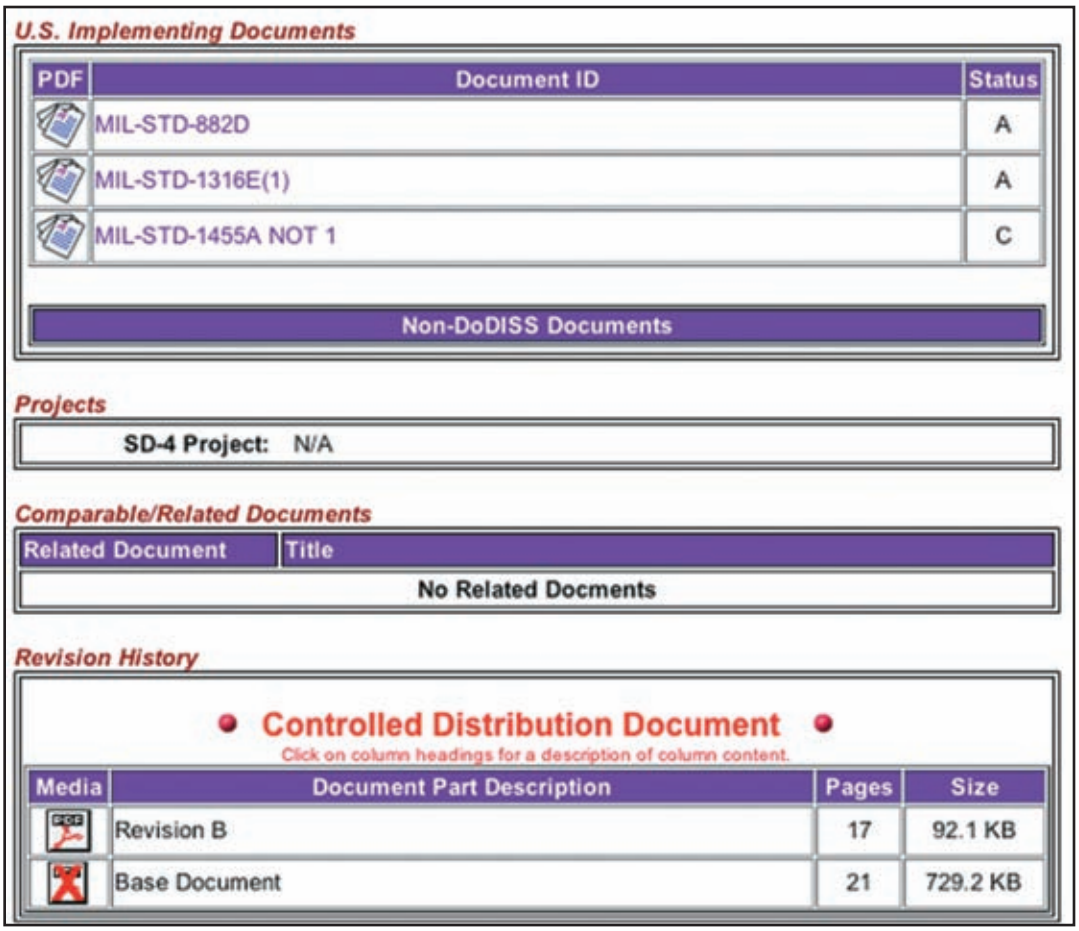
FIGURE 7.

Many of the items on this page are hot links to other information. For example, clicking the words "Preparing Activity" will retrieve a list of all 177 preparing activities. Clicking the preparing activity code, in this example, 06, will retrieve detailed information about the particular preparing activity, including point-of-contact information, phone numbers, and a list of the documents for which the activity has responsibility.

Clicking the ID of one of the U.S. implementing documents will retrieve the Document Details screen for the implementing document. Clicking the PDF icon next to the Document ID will retrieve that document's revision history and access to the actual documents, which then can be printed or a copy saved. Similar hot links exist on most pages within the PMT, enabling the user to quickly find the needed information or documents.

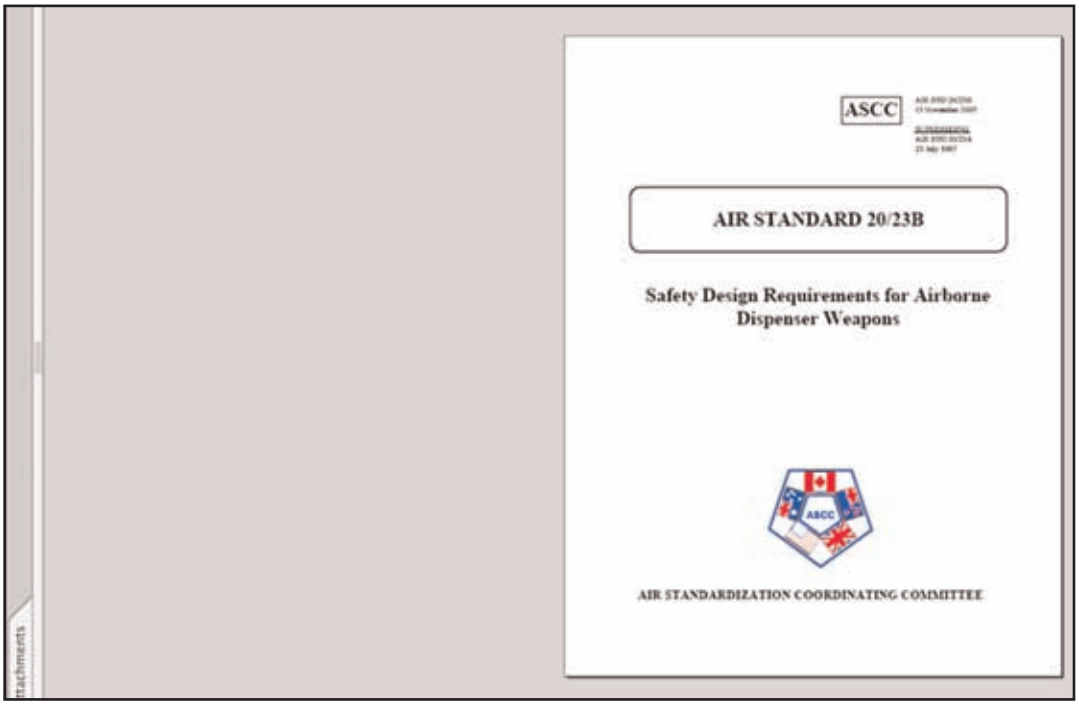
Clicking the icon (pages) at the top of the screen or scrolling to the bottom of the details page will access the document's revision history. Only the most recent versions of the documents are available through the PMT. Previous versions are shown in the record, but the images are not made available; the PDF icon is covered by a red "X," as shown in Figure 8.

FIGURE 8.



Clicking a PDF icon will retrieve the document (Figure 9).

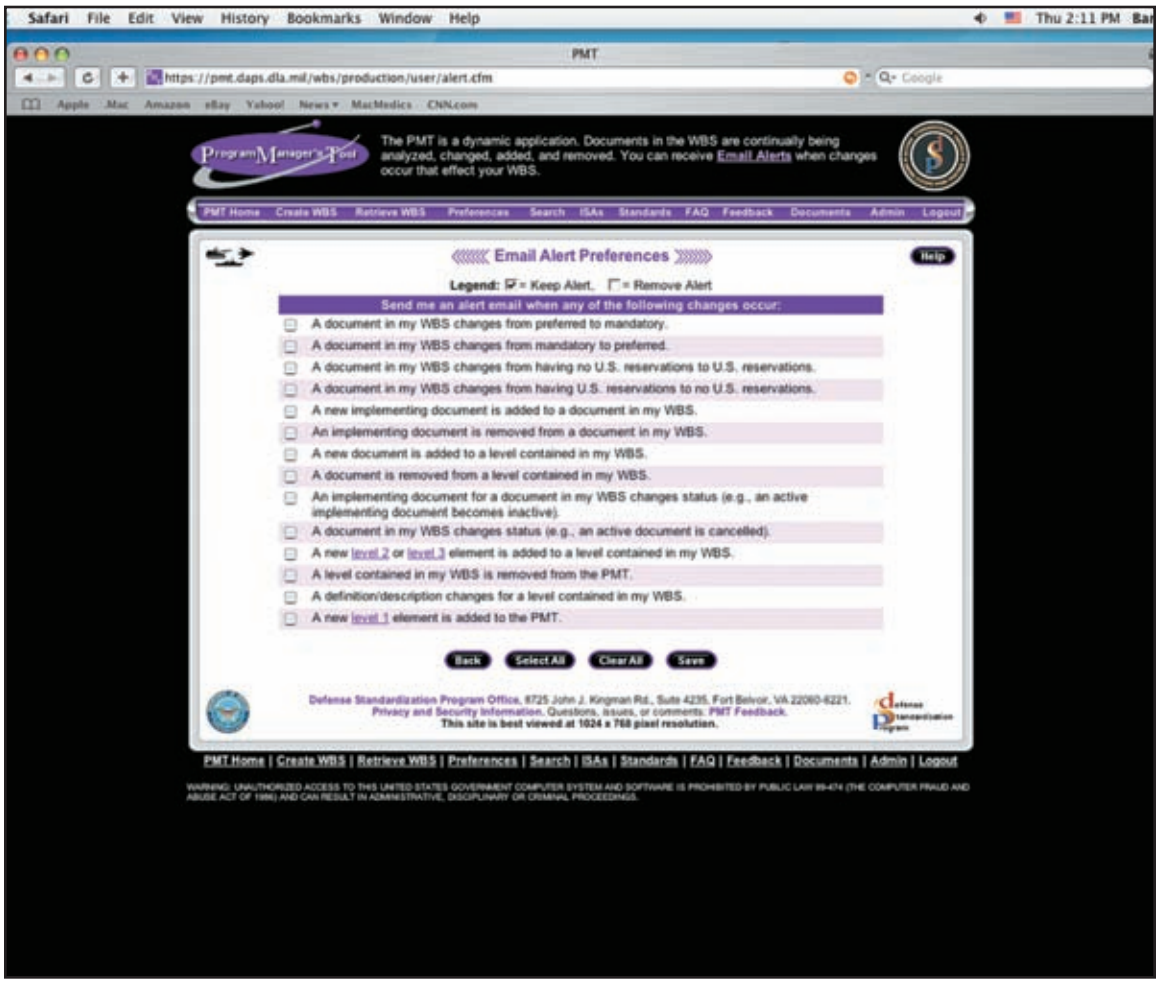
FIGURE 9.



At this point, the user can print the document, save a copy, or, in many cases search for key words within the document. The key word search functionality is an Adobe Acrobat feature that is available for only the newer documents in ASSIST and the PMT. All of the older documents are simply scanned pixel images, or bitmaps, that cannot be searched.

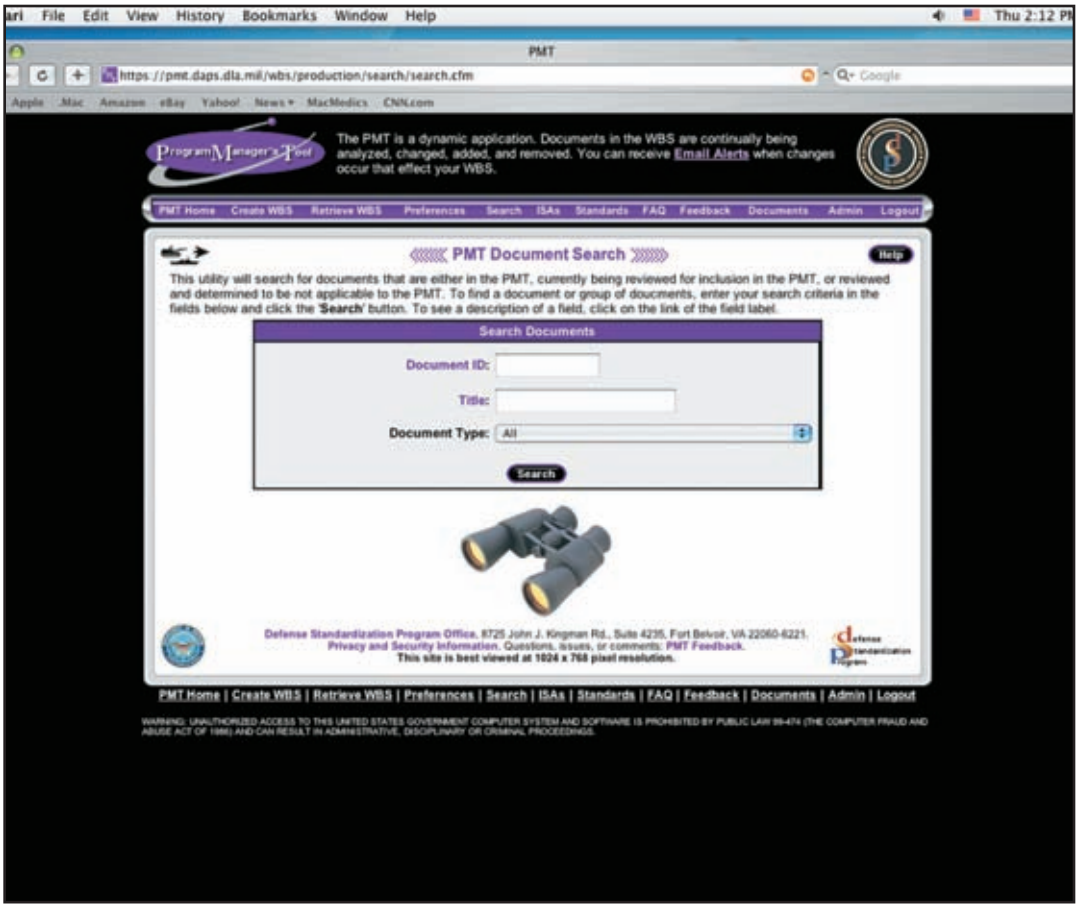
The PMT is a dynamic system with regard to content. The ISAs, specifications, and standards the user selects for a customized query may change over time for any number of reasons. If the user would like to be notified whenever one of the selected documents is changed, he may select "Preferences" from the main menu, and he will be given an opportunity to receive an e-mail alert any time one of the documents changes (Figure 10).

FIGURE 10.



Selecting "Search" from the main menu will allow the user to search for a document by Document ID number or by document title (Figure 11).

FIGURE 11.



If the user does not know the exact title, he can use one of the key words or an exact phrase as a search term, and the PMT will retrieve any documents with those words in the title. Likewise, he can search using a partial Document ID, and the PMT will retrieve any documents with the entered character string in the ID. Simple Boolean search functionality permits the user to limit the type of documents that will be returned.

Selecting "Feedback" will allow the user to make suggestions for improvements, report problems, or even ask questions.

Can Defense Industry Members Use the PMT?

Members of the defense industry can use the tool, but they must also obtain an ASSIST account and password and must arrange for access to the PMT. It is vital that members of the defense industry have access to this tool because, in a performance-based acquisition world, the industrial participants make many of the technical decisions, and they must have access to information that permits tradeoffs for design solutions that take ISAs and other standards into account. Having access to PMT information will help the defense industry provide necessary interoperability and fulfill U.S. obligations to our international partners under the agreements.

When in a Program's Life Cycle Is the PMT Useful?

The PMT has application at every point along the program life cycle. Let's explore a few examples for the development, production, and post-deployment logistics support phases.

DEVELOPMENT

Before there is a development contract, it is important for the program manager to be aware of any ISAs that may pertain to the program. It is even more important for the program contracts to contain performance requirements addressing the implementation of ISAs on the program. When a contract has an ISA-related performance requirement, it then becomes essential to address compliance with that requirement in milestone reviews. Early application of the PMT will help the PM understand and meet these requirements.

Early in the development phase, PMs should use the PMT to develop a list of the relevant ISAs. This list can be easily generated and maintained using the customized query capability. In addition, the PM can use the preferences feature to ensure that he will stay informed if any of the agreements change.

When materiel or part selection decisions are made during program development, the PMT can assist the program manager with quickly identifying potential, proven, and common technical solutions. Using the PMT for this purpose can speed the development process by rapidly identifying viable existing technical solutions, giving the team more time and resources to focus on those areas where developing new and innovative technologies is essential.

As programs increasingly require joint and multinational solutions, the PMT can assist the teams with finding opportunities for greater interoperability and commonality with added benefits such as shorter development time and lower life-cycle costs.

PRODUCTION

Many of the PMT applications cited for the development phase carry over into the production phase. It is particularly important for the defense industry partners to stay informed, using the PMT to remain compliant with the U.S.-ratified international agreements. Other important applications in this phase include keeping lower-tier subcontractors informed of ISA-related requirements.

Many of the standards in the PMT are essential for procurement of materiel items. The PMT gives the defense industry ready access to the procurement-related specifications and standards documents. Many documents contain essential test procedures critical for production and acquisition.

POST-DEPLOYMENT LOGISTICS SUPPORT

Just as the documents are essential for procurement in the production phase, they are equally important for reprocurement during post-deployment logistics support. In addition, when programs encounter diminishing manufacturing sources and materiel shortages, the PMT can provide useful assistance in finding alternative materiel sources or items that might be substituted for the problem item.

What More Should One Know About the PMT?

A new tool, the PMT is still evolving. New documents are continually being added to the system. Because new documents are constantly being developed, the tool will always be changing.

The PMT is designed specifically for program managers. Therefore, feedback from PMs and others will be essential for continually improving the tool. Whenever PMs identify a need for additional features, suggest changes, or request the addition or deletion of documents from the system, the DSPO intends to be responsive and continually improve the tool to meet the PMs' needs.

[1]A materiel ISA is the record of an agreement among several or all member nations of a multinational treaty organization to adopt the same or similar military equipment, ammunition, supplies, and stores.

[2]The term "standard" is used generically to represent any type of standardization document developed, approved, or adopted under the auspices of the Defense Standardization Program. Such documents include international standardization agreements, non-government standards, and defense and federal specifications and standards. For a complete description of these types of standardization documents, refer to DoD 4120.24-M, *Defense Standardization Program (DSP) Policies and Procedures*, which is available online at www.dsp.dla.mil.

About the Author

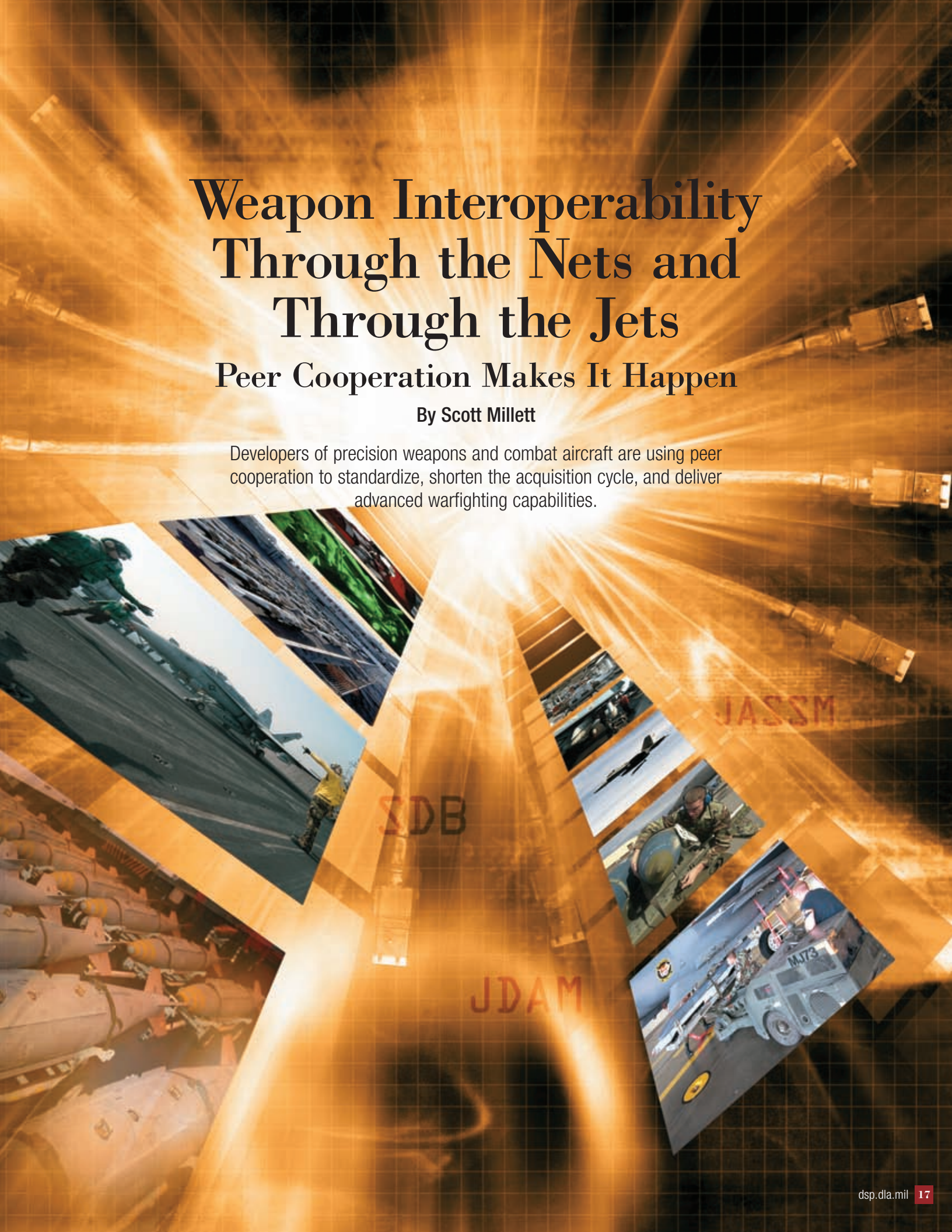
Ron Zabielski is a member of the Defense Standardization Program Office staff.

Weapon Interoperability Through the Nets and Through the Jets

Peer Cooperation Makes It Happen

By Scott Millett

Developers of precision weapons and combat aircraft are using peer cooperation to standardize, shorten the acquisition cycle, and deliver advanced warfighting capabilities.



The information age has arrived in the defense industry, and much of our current effort is focused on network-centric command and control. However, one of our new capabilities that is most dependent on this information is the new crop of precision-guided munitions (PGMs) such as the Joint Direct Attack Munition, the Joint Standoff Weapon, the Joint Air-to-Surface Standoff Missile, and the developmental Small Diameter Bomb. These "smart" weapons deliver their extraordinary "one mission, one weapon" precision using on-board computers, inertial navigation systems, global positioning system (GPS) satellite receivers, and (in some cases) infrared or laser seekers. All of these subsystems need information to do their jobs.

PGM input data come from a variety of sources:

- Pre-mission planning at a workstation, which uses a variety of targeting sources and databases to define a mission data file—a complete script of mission instructions
- Automatic weapon initialization by the launch aircraft, including inertial system transfer alignment, GPS receiver signal acquisition data, power-up sequence instructions, and downloading of mission data files
- In-flight updates for target-of-opportunity missions, which are generated by the launch aircraft's on-board sensors, as directed by an aircrew interface
- Third-party mission data files for time-sensitive targets, which are sent to the aircraft from off-board sources by voice radio or digital data links, then accepted through an aircrew interface and transferred to the weapon
- Post-launch mission updates, sent via a weapon data link from the launch aircraft or another cooperating controller, for weapons equipped with data link radios.

Until recently, providing the data required custom software for each weapon on each aircraft and custom messages on each data link. That customization increased the cost and especially the time required to put each new PGM into service.

Origins of Logical Interface Standardization on Weapons

In the 1980s, a DoD-wide effort developed the MIL-STD-1760 interface, which defined a connector, a discrete-wire signal set, a serial data bus with a command protocol, and standard data words. The interface allowed all of the PGMs to be integrated onto every aircraft in the DoD and NATO fleets using a single standard connector. MIL-STD-1760 enabled today's PGM acquisition and integration process by ending the hugely expensive practice of re-wiring fleet aircraft to accept each new weapon.

MIL-STD-1760 did not attempt to standardize functionality (how the signal set and data words controlled the weapons) because all weapons differed somewhat in their functionality.

The earliest of these weapons started development during the wave of acquisition reform, ensuring that weapon vendors had maximum design freedom. Weapon programs were able to save money by copying each other's interfaces where it suited them, but were free to depart on their own strategies whenever convenient. As a result, although all weapons' interfaces with their launch aircraft were similar, each weapon's mission files and bus messages were unique in some ways.

A Job Partially Done

As the first wave of these weapons was integrated onto the many platforms (fighters, bombers, and attack aircraft) of the U.S. Air Force and Navy, developers learned that a significant fraction of the cost and fleet delivery schedule of weapon development was driven by programming the operational flight programs (OFPs) of their launch platforms.

Because of the complexity and extreme reliability required of combat aircraft OFPs, they all perform periodic "block updates" of their software. This ensures that each new and modified block of code is extensively tested with all of the other code in the jet. These block update cycles typically start every 18 to 30 months, and the total development time from requirement freeze to fleet delivery is usually 2 to 4 years. Each platform's OFP cycle is independent of the others.

As a result of these schedule issues, it can often be several years after a weapon's first availability before it can finally be used on all of the aircraft that want it.

Weapons have had to be individually integrated into each launch aircraft's OFP because, although each weapon's interface is similar to the others, a few aspects are always unique. Even small differences require custom programming.

Although the pre-launch interface of weapons to platforms had been partly standardized by the MIL-STD-1760 connector, there was virtually no commonality among post-launch weapon data links. Weapon data links were cumbersome external pods, and the operation of each weapon via those pods differed significantly, ranging from merely slewing a cursor on one weapon to designate a refined aimpoint, to actually steering another weapon through its link. These real-time interfaces, which often included live video, made for complex, unique, and very expensive aircraft integrations for each weapon.

The New Wave in Weapon Interoperability

Around the turn of the millennium, acquisition managers in the air-launched weapon community embarked independently on several interoperability initiatives to serve the different needs of several different customers. Remarkably, they have all aligned to provide real synergy.

These initiatives include three interoperability standards:

- ***MIL-STD-3014, Mission Data Exchange Format (MiDEF).*** MiDEF is a common mission data file format that will support all strike weapons with a common header and very flexible internal structure. Unlike legacy mission file formats, which had fixed file sizes and defined data by its file location, MiDEF defines data content by a sort of table of contents, allowing compact file sizes that are critical when they are sent over data links. MiDEF is a sort of "PDF" file format for mission data. MiDEF files can be sent over any communications channel by a single protocol, regardless of source, destination, content, or size. (For more information, see http://mil-std-3014.navy.mil.)
- ***Two Tactical File Transport Protocol messages: J16.X and K02.X.*** These messages are designed to transport tactically critical files over tactical data links like LINK-16 and VMF, which use J-series and K-series messages. Each message carries a serialized packet of file data and identifies the file's type.

Three cross-program interoperability initiatives are underway that use these standards to deliver more capability to warfighters, faster and cheaper:

- ***BrickLink.*** BrickLink uses the J16.X and K02.X messages to carry MiDEF files from command and control locations like air operations centers and carrier intelligence centers to aircraft in flight, to deliver complete weapon mission plans for time-sensitive targets. BrickLink will let tactical data links act like the digital data transfer devices (colloquially known as "bricks") that carry platform and weapon mission data files out to airplanes before each mission.
- ***Universal Armament Interface (UAI).*** UAI is a common interface control document (ICD) that allows a single software module in each aircraft's OFP to support all PGMs. UAI is a comprehensive, general-purpose interface that can be "tuned" to the particular needs and capabilities of each weapon by means of configuration data files that are uploaded along with current mission planning data. With UAI, integrating a weapon's digital interface to a platform can be achieved without "cracking the code" of the platform's OFP; it's a matter of defining and testing new configuration data files.

  When a new weapon requires new functionality in the platform OFP, that functionality will, of course, have to be implemented in new OFP code. But if that new functionality is developed within the UAI ICD, it becomes immediately available to all future UAI weapons.

  A key element of UAI is its transfer of MiDEF files as the single method by which all missions are delivered to all weapons. Using MiDEF isolates the contents of weapon mission data files from the ICD. That greatly simplifies UAI, because all MiDEF files are transferred in exactly the same way to all weapons, without regard to their size, content, or destination.
- ***Weapon Data Link Network (WDLN) Advanced Concept Technology Demonstration (ACTD).*** The WDLN ACTD is developing a common network message interface to control air-to-ground weapons with existing tactical data links such as LINK-16 and VMF. WDLN is developing a message-level ICD for both J- and K-series messages that will allow the use of common weapon control practices and messages in all data links and for all weapons. WDLN ACTD uses MiDEF files transferred over J16.X and K02.X messages to deliver major updates or completely new missions to weapons in free flight.

Separating Data Content Standards from Communications Protocol Standards

Current military tactical communications are built around the fundamental unit of the heavily formatted "message." To put this into familiar terms, you can think of each message as a pre-formatted e-mail, and you fill in each blank by clicking it and selecting data from a drop-down list. Each channel chooses its own data standards, so messages on each channel (such as tactical data links and aircraft data buses) are usually incompatible, with equivalent messages on other channels, at both the bit-field and organization levels.

Comparable to sending e-mail attachments, new initiatives define a minimally formatted e-mail message whose only task is to send a packet of a file. The receiver reassembles packets into the original file. This allows critical file data content to be designed independently of today's tactical communications channel protocols. Two new capabilities have obvious benefits to warfighters: the same data can be sent over any channel without reformatting, and new content can be introduced without updates to communication links.

Peer Cooperation Makes It Possible

These cooperative efforts have stemmed, in large part, from the team and culture that came about to de-

velop the MIL-STD-1760 interface and to maintain it over the years. Since its early development, MIL-STD-1760 has been maintained by a broad international industry-government team: a cross-section of aircraft and weapon prime contractors, second-tier providers (of interface chips, embedded computers, cables, connectors, and the like), government program offices for aircraft and weapons, and government standardization personnel. The MIL-STD-1760 User Group is sponsored by one of the leaders in aerospace standards, the Society of Automotive Engineers (SAE,) through its Aerospace Council, Avionics Systems Division, and its Aircraft-Store Integration Subcommittee. This user group meets quarterly, and its membership has been stable over the years. Members are often the lead integrators for their business units, with broad expertise, experience, and influence. Over the years, this stable membership has evolved into mutual respect and trust among the members, and an unusually fertile environment for standards. All of the interoperability initiatives above trace their primary contributors to this group that meets at quarterly SAE committee meetings.

Another level of active cooperation and initiative exists among the colonels and captains who are the acquisition managers for the aircraft and weapons involved, and their predecessors who are now flag-level program executive officers. Their operational background (most are aviators) has proved to them that teamwork between disparate experts and systems can achieve a common goal. These acquisition professionals are overcoming the acquisition and bureaucratic roadblocks that challenge interoperability between programs, across commands, and even between services and countries. Their confident, can-do attitude has made these initiatives happen. Across military services and many aircraft and weapons, these leaders have given active support to standards initiatives that would ultimately bear fruit for the warfighters, but not on their watch.

Interoperability has been an increasing priority among warfighters who see the power it buys, but our requirements and acquisition processes have long been focused on individual acquisitions. We don't yet have a way to define warfighter requirements for interoperability and thus ensure that individual acquisitions are truly interoperable. It has been left to the teams that develop the products to come together, cooperate, and innovate. They sacrifice some of the autonomy that was given them under acquisition reform, and use their management discretion to support the overall needs of their warfighters, even though those needs don't translate to specific requirements for each of their products.

Improved, But Not New!

Perhaps the most important aspect of this new way of providing weapons to our warfighters is that every one of these initiatives is being achieved entirely within the interface software of existing acquisition programs. No new acquisition products will be required. All of this is happening because of peer cooperation, cooperative development of standard interfaces, and cooperative implementation of those standards into software upgrade cycles on each program. This process to deliver interoperability is not easy, and it is not free, but it is a remarkably effective and affordable way to deliver real, new combat capability to warfighters, using the same weapon systems they already use so effectively today.

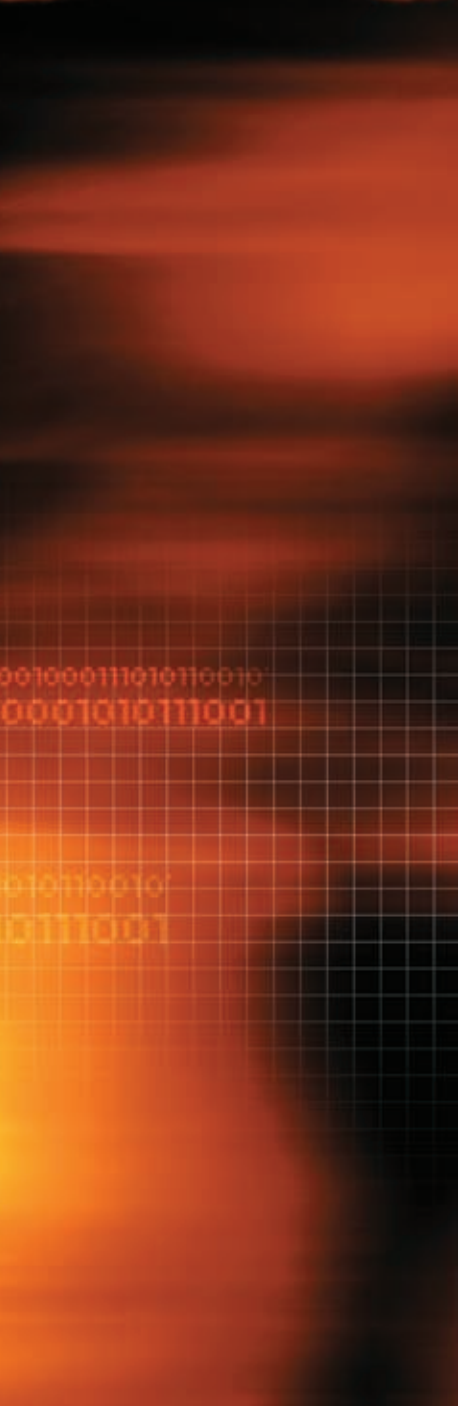
About the Author

Scott Millett is a net-centric weapons interoperability engineer at the Weapon Engagement Office, Naval Air Warfare Center, Weapons Division, China Lake, CA. He holds a patent for payout of fiber-optic weapon data links, and he shares a patent allowance on the guidance system used by some laser-guided bombs and training rounds. He is the responsible engineer for MIL-STD-3014 and, for the last 6 years, has been an active developer of open-architecture integration solutions for tactical aviation.

Knowledge Management

The "Master Key" to Successful Programs

By Mike Mazza, Karen Poffenberger, and Michael Kozak



It can be agreed that the key to the success of any program is to have the right information at the right place at the right time to make important decisions that enable a program to meet cost, schedule, and performance objectives. This article highlights the importance of knowledge management and how it can serve as the "master key" that will open many doors for the program manager (PM) to implement standardization initiatives that will help ensure a successful program. How does this happen? It may sound simple, but in fact, it is difficult to implement. Programs cannot be successful for an extended period of time unless they develop business and culture change processes that help them manage knowledge. In order for the PM to reduce the risks and not rely on luck for the program to be successful, the PM must develop business processes to standardize documentation, normalize data and information, and establish appropriate management controls on the "knowledge" products that ultimately lead to accomplishing the goals and objectives of the program. Information is knowledge, and knowledge is power.

Knowledge-Based Acquisition

(Excerpt from *Defense Acquisition Guidebook*, Chapter 11.5)

Knowledge-based acquisition is a management approach, which requires adequate knowledge at critical junctures (i.e., knowledge points) throughout the acquisition process to make informed decisions. DoD Directive 5000.1 calls for sufficient knowledge to reduce the risk associated with program initiation, system demonstration, and full-rate production. DoD Instruction 5000.2 provides a partial listing of the types of knowledge, based on demonstrated accomplishments, that enable accurate assessments of technology and design maturity and production readiness.

Implicit in this approach is the need to conduct the activities that capture relevant, product development knowledge. And that might mean additional time and dollars. However, knowledge provides the decision maker with higher degrees of certainty, and enables the program manager to deliver timely, affordable, quality products.

About Knowledge Management

Knowledge management consists of systematic and disciplined actions that a program can take to obtain the greatest value from the knowledge available to it. "Knowledge" includes both the experience and understanding of the people in the program and the information the program itself creates, such as documents and reports. This knowledge is also referred to as tacit knowledge (what the person knows, which is derived from experience, beliefs, and values) and explicit knowledge (such as a document, which is typically created to facilitate communication with other people). Both forms of knowledge are important for program success. Effective knowledge management requires an appropriate combination of organizational, social, and managerial initiatives. The art of capturing, storing, and organizing this knowledge and experience and making it available at the right time and place to those who need it is the underlying key to standardization and success.

Integrated Digital Environment

(Excerpt from *Defense Acquisition Guidebook*, Chapter 11.12)

Program managers should establish a data management system within the Integrated Digital Environment that allows every activity involved with the program to cost-effectively create, store, access, manipulate, and exchange digital data. This includes, at minimum, the data management needs of the system engineering process, modeling and simulation activities, test and evaluation strategy, support strategy, and other periodic reporting requirements.

Converting Tacit Knowledge to Explicit Knowledge

Why should programs convert tacit knowledge to explicit knowledge? The answer to this question may be quite simple when we consider the following example: Think about the most valuable employee on your program who will retire within the next year. This individual is always the "go-to" person during a problem situation. The reason you approach this person is because he or she has most likely dealt with this problem or issue in the past and may have some "lessons learned" to share when dealing with a like issue. This person's collective experience always provides the solution to your problem. But, what if this person is now retired and you do not have a source to go to for this tacit knowledge? You think to yourself, "if only this person documented the critical information and lessons learned that were in his or her head over the past 30 years of employment with the organization, we could always tap into the expertise of this individual for the next 30 years." The documentation of this critical information and lessons learned of the employee's experience becomes explicit knowledge when it is documented on paper, in a database, or within a knowledge management system. Think about the value added to your program if you only took the time to document the critical tacit knowledge of your employees and converted it to explicit knowledge. If capturing this knowledge becomes a standard process in your organization, the information is not lost when the employee leaves.

Explicit knowledge (documents), in electronic or hard-copy form, support critical business processes throughout the program. They provide the links in the process, record the actions and results of the process, and account for the majority of inputs and outputs that connect the steps within the process. In-

dividual employees capture these critical process links, but they are often locked away in their electronic form on hard drives, or in hard-copy form in file cabinets on their system, or in their office, inaccessible to the entire team. Because the entire program team does not have access to this knowledge or information, we will refer to this as tacit knowledge. The knowledge contained within these documents, whatever the form, is an essential asset of any organization and thus should be captured and managed so as to standardize the use and reuse of those assets throughout critical business processes and decisions. Forward-thinking programs will develop processes to convert critical tacit knowledge into explicit knowledge utilizing three core technologies of the 21st century: electronic document management, electronic record management, and workflow (process automation) and task management. The PM must have a process in place to standardize and integrate these core areas to prevent employees from creating "islands" of critical information. An enterprise knowledge repository will assist the PM with making an "educated" decision.

Application of an Integrated Digital Environment in the Critical Reagents Program

The Critical Reagents Program (CRP) is responsible for producing, optimizing, and standardizing the use of bio-warfare detection and diagnostic test kits used by the U.S. military. It was the CRP detection kits that first identified the anthrax powder in Senator Daschle's office on October 11, 2001, and it was the CRP detection kits that identified ricin toxin in Senator Frist's mailroom on February 2, 2004. In order to standardize, the CRP established a collaborative process that utilizes an integrated digital environment that enables the best ideas of DoD scientists to be brought forward, shared, and integrated into one joint solution when dealing with the threat of bio-terrorist attack. Virtual teaming and standardization of processes not only save time and money; they also save lives.

Resistance to Knowledge Management

After defining knowledge management and understanding the importance of the relationships between tacit knowledge and explicit knowledge, you may think that everyone within your program will climb aboard the "knowledge management and information sharing train." Nice thought, but incorrect. Even in the best of times, it's a battle to convince employees to participate in knowledge management programs. But in tough times, the tendency is for employees to horde what they know. The following discussion will give you some ideas on how to influence the program team to "buy in" to the standardization and information sharing process for the benefit of your program.

Gaining Buy-In to Knowledge Management

The members of your program team already believe they have more work than they can handle, and now you want to add another thing—this "knowledge management-standardization" concept—to their plate. Therefore, you must find ways to integrate knowledge collection and dissemination into the team's everyday job. You must standardize information collection and dissemination so that it becomes common practice. The knowledge management system should be developed around the business processes within the program. By standardizing business processes, the program streamlines the process, which ultimately saves time and money.

Some programs make the mistake of buying a knowledge management software package before reviewing their business processes and requirements. Time must be taken up front to analyze and identify

Army Knowledge Online

As noted by S.L.A. Marshall in *Men Against Fire: The Problem of Battle Command*,

> During war, it oftentimes happens that one company, by trial and error, finds the true solution for some acute problem which concerns everyone. But when that happens to a company, I can assure you that it is the exceptional company officer who takes the initiative and passes his unique solution along to his superiors even after he has proved in battle that the idea works. A good company idea in tactics is likely to remain confined to one company indefinitely, even though it would be of benefit to the whole military establishment. Such omissions are not due usually to excess modesty or indifference on the part of the officer, but to his unawareness that others are having the same trouble as himself.

Army Knowledge Online is the Army's Knowledge Management Center to provide real-time collaboration and knowledge sharing across all known typical boundaries. The value added in human life is immeasurable. Also the resources, time, equipment, and lessons learned are a significant value in cost avoidance.

A unit network can provide a competitive tactical advantage to the warfighter by creating, supporting, and improving unit knowledge centers as well as providing a virtual right-seat-ride for units deployed or preparing for operational missions.

an organization's requirements and key processes. If a software package is purchased without this critical step occurring, employees may be forced to change the way they do business just because the software package is not designed or programmed to perform certain functions. This creates frustration and resistance for the employee. Most of the time, employees just ignore it if they so choose. Therefore, the knowledge management system must ultimately help people do a better job, whatever their function. The employees must feel that it makes their job easier, not harder.

Employees also must feel that their ideas and suggestions have been taken into consideration. When they feel that they have had input into this "new" system called knowledge management, the buy-in is happening from the beginning, not at the end when you have purchased software and it just shows up on their desktops one morning unannounced. If possible, it is helpful to form a working group of individuals from various groups or departments throughout the organization that can bring ideas to the table and relay information back to their group or department, so that everyone in the organization has the feeling of being heard. In addition, these same working groups can be used to standardize the system once implemented. When the system offers consistency across the organization, employees will know where and how to find the information for critical functions such as decision making.

"People have to see tremendous immediate benefit," says Barbara Saidel, Chief Information Officer for Russell Reynolds Associates (recruiting company). "They have to see, smell, touch and taste how it's going to improve their work lives." Recruiters document their search efforts in the application they already use to do their jobs, so that they don't have to open a second application and make a special effort to capture the knowledge. While the recruiters are on the road, they dictate candidate notes into assistants' voice-mail systems with no typing or Internet connection required. To drive knowledge management at Russell Reynolds, the company circulated a document every afternoon throughout its 32 offices worldwide that showed all outstanding proposals and projects. All employees were expected to read it carefully and respond immediately if they could share a contact or industry background. Recruiters with positions to fill saw instant benefits when they got on-the-spot help from people they have never met but work for the same company. Tapping into the network of contacts of more than 700 employees helped the company fill positions faster, which drove greater client value.

At Giant Eagle, a deli manager hit on a way to display the seafood delicacy that proved irresistible to shoppers, accounting for an extra $200 in 1-week sales. But uncertain of his strategy, he first posted the idea on the KnowAsis portal. Other deli managers tried the idea in their store and saw similar profits. The total payoff to the company, for this one tiny chunk of information, was about $20,000 in increased sales. Seeing the bottom-line benefits of sharing knowledge propelled the employees over their initial misgivings, spurring them to try and out-hustle each other on having the best suggestions, rather than the usual metrics. "Now they're competing in the marketplace of ideas," said Russ Ross. "It became a 'Look What I Did' showcase. Everyone wanted to put something in there," said Brian Ferrier. Ferrier made a point of getting on the portal at least once a day to find practices that helped him make money.

In each case, the employees saw that their ideas and suggestions were being heard and making a difference. In addition, the employees saw this standardized knowledge sharing process as helping to make their jobs easier, thus saving time and ultimately saving money. These are just a few examples of the successful use of knowledge management that have led people to want to buy in to the process through its proven value to the program.

Implementation

The implementation of an integrated knowledge management solution supporting critical business processes will cause fundamental changes in the way a program carries out its business practices. This integrated knowledge management solution will help an organization standardize and streamline processes. The impact of these changes must be managed and the expectations of the participants and the management must be set appropriately. Reasonable goals must be set and achieved.

Implementing across the enterprise is not always possible, however. A scalable system could be deployed so that as the experience and comfort levels expand, the system can grow to support more processes and users until it becomes the preferred method for accomplishing critical program tasks throughout the entire organization. Implementing in stages is often the key to success; starting with the department that showed the most support during the buy-in stage. This group can then be used as a champion for the rest of the organization. As you continue implementation, you will have multiple champions that help to aid the knowledge management process buy-in throughout the entire organization.

Pilot systems are often more manageable and can be used to prove that the technology works and is applicable to your business processes and business culture. Once adoption of the technology is achieved, the pilot system can grow, supporting additional functional areas. Growth of the pilot system allows leveraging of smaller capital investments already made and is dependent on the selection criteria of the tools used to build the pilot system in the first place.

The risk in not doing so is not only the loss of the technological investment and the resources used to develop the system, but could potentially include the intellectual capital captured in the system as well.

A highly skilled integration team must be assembled and a structured method should to be used to develop a successful roadmap for the overall design and implementation of an integrated knowledge management system. The most appropriate of the many tools and techniques available in the marketplace have to be identified. The tools and techniques purchased should relate to the organization's goals, requirements, and key processes identified in the buy-in step.

Conclusion

Today, workgroups supporting programs are scattered in smaller teams around the globe. The network, intranet, and Internet are at the center of the universe. Processes can no longer exist as islands; they must be standardized and streamlined. Knowledge is being shared with wider audiences over vast geographies and at breakneck speeds.

Using an integrated knowledge management solution to standardize, capture, and deliver the right knowledge to the right knowledge worker and decision maker at the right time will become a competitive advantage to the program and the program manager and, ultimately, will work as a source of risk reduction, revenue enhancement, and cost containment. An additional byproduct is the ability for the management team to consistently measure and monitor the performance of the program using the matrix data provided by performing work in a standardized manner. This will also provide for continuous improvement opportunities and a quality assurance process that is unmatched. By using your most valuable assets—your employees and their knowledge—to form a standard system of information capture, storage, organization, and dissemination, you can create a win-win atmosphere for everyone on the team.

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About the Authors

Mike Mazza, Goldbelt Raven LLC, is the deputy program director for the Critical Reagents Program. He is responsible for establishing a formal quality management system that integrates and improves business processes across the program. He has over 16 years of service in the military and over 6 years of experience integrating knowledge management solutions.

Karen Poffenberger, Camber Corporation, is the subject matter expert and senior systems analyst for the Joint Program Executive Office for Chemical and Biological Defense. She is responsible for all aspects of implementing an enterprise knowledge/content management solution for the office, including automating and streamlining knowledge management within the enterprise.

Michael Kozak, Camber Corporation, is a program manager for the Operation, Training and Testing Division. He has conducted systems analysis and data collection for current operational improvements.

The NAVAIR Integrated In-Service Reliability Program

"Make It Last Longer and Cost Less"

By Debbie Vergos

The Naval Air Systems Command (NAVAIR) established the Integrated In-Service Reliability Program (IISRP) to address the concerns of the Navy's leadership with respect to rising operations and maintenance costs in naval aviation and the apparent decline in the reliability of Aviation Depot Level Repairable (AVDLR) aviation components. The problem was outlined as issue 16 in the April 1998 *Aviation Maintenance and Supply Readiness Report*.[1] Subsequent research by the NAVAIR Cost Analysis Competency (AIR 4.2.5) determined that AVDLR component repair costs consumed more than 54 percent of the Flying Hour Program budget, with costs increasing annually in the range of 8 percent to 11 percent.

With naval aircraft serving in harsh combat environments supporting the war on terror, the reliability and time-on-wing for many of these components continued to fall. NAVAIR's challenge in developing a standardized component reliability program was made more difficult by the lack of existing processes, tools, trained personnel, and ability to track components at the serial number level. In response, the Commander, NAVAIR, directed the establishment of a business process reengineering (BPR) team to improve component reliability, lower fleet operational costs, standardize and document the processes to accomplish these goals, and export these processes to Navy and other DoD support teams.

The efforts of the BPR team centered around defining the problems causing declining reliability and developing a standardized in-service reliability and maintainability (R&M) analysis process using the available NAVAIR tools and procedures. Concurrently, the team was benchmarking best commercial practices, tools, and techniques to improve the accuracy of analysis and predictions, automate data collection and compilation, streamline the process, and standardize all aspects of the process so that it could easily be exported to all of the fleet support teams (FSTs). Considering the very successful initial results of this program and the demonstrated potential for further improvements to reliability and reduced life-cycle costs, the NAVAIR Assistant Commander for Logistics (AIR 3.0), Assistant Commander for Engineering (AIR 4.0), and Assistant Commander for Industrial Operations (AIR 6.0) unanimously concurred that the BPR team should be incorporated into NAVAIR operations as the IISRP in May 2002.

Today, the IISRP team is a dynamic integrated product team with members from the AIR 4.0 and AIR 6.0 competencies with elements at headquarters and each of the naval aviation depots. Their primary purpose is to select, analyze, fix, and measure high-value AVDLR components exhibiting poor reliability while in service. The IISRP teamed with the Reliability Analysis Center (RAC)—the DoD information analysis center for reliability—to ensure that the methods developed were standardized and based on best industry and DoD practices. The team evaluated data compilation, formatting, and analysis techniques; application of automated R&M tools; root cause analysis methods; interactions between organizational, intermediate, and depot maintenance activities; logistic element management; and other support functions related to in-service R&M.

Working closely with the integrated program teams within NAVAIR, the IISRP team identified significant shortcomings in nearly every area and set about developing required strategies and processes to fully implement a component in-service reliability program. A three-phased program model was developed with a dual strategy of achieving significant improvements in component "time-on-wing" with corresponding reductions in the "beyond capability of maintenance" rates using existing capabilities and

processes while working to advance, mature, and standardize the capabilities and processes used by the team.

The IISRP team learned early that collaboration is the key to success. Since inception, the team has focused on playing to the strengths of each stakeholder in the support process. Team members have formed strong ties with their peers on the FSTs and other support organizations to ensure that all elements of logistics and engineering are thoroughly reviewed during the study of selected components. These relationships have resulted in many accomplishments, such as the following:

- Development of a strategic partnership with the Defense Logistics Agency (DLA), the provider of consumable material used in the repair of AVDLR components, and the Aircraft Equipment Reliability and Maintainability Program (AERMIP), a research and development (R&D) program to address R&M deficiencies in naval aircraft. The partnership is working jointly and synergistically to resolve reliability problems. As a result of this effort, DLA is now funding multiple redesign projects, and the AERMIP is tailoring R&D data mining and research efforts to support IISRP analysis of components.
- Development of a strategic partnership with Naval Inventory Control Point (NAVICP) Philadelphia to work jointly in the resolution of reliability problems on critical, high-value AVDLR components. A close working relationship is now in place between the individual Integrated Weapons System Team managers and the IISRP team. Meetings are held at least twice a year to jointly choose new candidates for study and to evaluate the performance of components previously studied.
- Development of a standardized set of processes used across the NAVAIR enterprise to investigate and resolve reliability problems.
- Preparation and publication of a management manual, *Guidelines for the Naval Aviation In-Service Reliability Program*.
- Development and implementation of a standard, statistically valid Cost Avoidance Projection Model approved by the Naval Supply Systems Command, NAVICP Philadelphia, and AIR 4.2.5.
- Development of a comprehensive online reliability database to track and monitor the results of all IISRP studies based on the IISRP Cost Avoidance Projection Model. This database is now being shared with teams working on airspeed, program enterprise teams, and other aviation support groups.
- Working with RAC and industry experts, incorporation of the internationally recognized Crow-AMSAA reliability growth model into a user-friendly software application allowing for standardized analysis of components under investigation. This software incorporates all of Dr. Larry Crow's past and current reliability growth analysis research and methods and is available commercially to all organic and military users.

To ensure standardization, the IISRP management team continually ensures that the component analyses are performed in accordance with the standardized IISRP processes, trains FST personnel in these processes, and reviews IISRP-related documents and software tools. At quarterly IISRP management reviews, the team conducts peer reviews on the studies completed to date to validate findings and cost projections as a means to improve processes and techniques. Also, the team leads, through ongoing, near-daily communication, discuss ideas and tech-

niques before submitting them to the program office for incorporation into the formal process documentation. This communication provides vital feedback for the IISRP headquarters management team and enables the program manager to accurately assess the effectiveness and efficiency of the program.

Since the IISRP's inception, the net effect of the collective efforts has been significant improvements in AVDLR component availability, resulting in reduced operating costs and improved fleet readiness. As of the end of the first quarter of FY05, the IISRP team had completed 246 AVDLR component studies resulting in a cumulative cost avoidance of more than $171 million; that cost avoidance is due to reduced component demand and material usage. The application of standardized, systematic, and data-driven analysis processes has enabled the IISRP team and FST members to identify the root causes of major readiness degraders and, subsequently, to develop cost-effective solutions to these problems.

The IISRP team strives for continuous improvement and actively participates in professional forums in the R&M and support communities. Team members have presented briefs and papers at several conferences such as the DoD Maintenance Symposium, the Acquisition Excellence Conference sponsored by Naval Aviation Depot Jacksonville, and the Applied Reliability Symposium. In addition, Dr. Larry Crow has presented papers discussing IISRP-related analysis methods at three annual Reliability and Maintainability Symposiums. IISRP personnel have also established an ongoing relationship with the Naval Postgraduate School as another means to ensure that they stay current with leading trends in the field of study and to share lessons learned with the systems engineering faculty.

The IISRP team is committed to providing the highest possible payback to the fleet for resources dedicated to this effort. The team remains absolutely focused on ensuring that the AVDLR components produced by the Navy's aviation depots and aircraft intermediate maintenance departments are of the highest quality and will meet their designed service life limits to the maximum extent possible. These efforts are making major contributions to cost-wise readiness and helping NAVAIR provide outstanding support to the warfighter.

[1]The conduct of a study and the issuance of a report were directed by a joint message (CINCPACFLT 270358 ZMAR98) issued by the Commander in Chief, U.S. Pacific Fleet; Commander in Chief, U.S. Atlantic Fleet; Commander, Naval Air Systems Command; and Commander, Naval Supply Systems Command.

About the Author

Debbie Vergos is the program manager of the Integrated In-Service Reliability Program and is the executive director for Aviation Depots/Executive Officer. Prior to NAVAIR, Ms. Vergos spent 4 years at the Joint Logistics Systems Center and was at Naval Air Depot North Island for 22 years where she served in several positions. Ms. Vergos has received numerous awards throughout her career, including two Meritorious Civilian Awards, recognition from the other military services and *USA Today*, and the Rochester Institute of Technology National Quality Award.

The Weapon System Impact Tool

Assisting Weapon System Program Managers

by Ron Zabielski

Advanced search types:

Query by National Stock Number (NSN)

Query by NSN allows the user to view all weapon systems the NSN is used in along with the specification documents that govern the use. The results returned by the query include the specification document number, the weapon system designator code and descriptions for each.

Query by Specification Document Number

This query allows the user to view all the weapon systems affected by a specification. The results returned by the query include the specification document number, a description of the specification, along with the designator code and description for the weapon system. The results returned by the query include the WSDC, a description of the weapon system, and the number of NSNs in the weapon system affected by the specification.

Query by Weapon System Designator Code (WSDC)

Query by WSDC allows the user to view all specifications which govern the parts in the weapon system. The results returned by the query include the specification document number, a description of the specification, and the number of NSNs in the weapon system governed by the specification.

Query by Specification Document Number & Weapon System Designator Code (WSDC)

This query allows the user to view all the NSNs affected by a document in a weapon system. The results returned by the query include the NSN, information about where the relationship. The user also has the opportunity to view the underlying raw data.

No matter which military service manages a weapon system, it must perform certain core activities at each stage in the weapon system's life cycle. At each point in the life cycle—whether development, production, readiness, or sustainment—the weapon system program manager must be concerned about the impact of standards on the system and must have access to the data and information needed to assess this impact.

Much has been written about how a program manager can reduce the total life-cycle costs of a weapon system through parts management.[1] The key objectives of parts management include

- improving logistics support,
- enhancing reliability, and
- managing obsolescence.

Effectively meeting these objectives will provide such benefits as

- cost savings,
- enhanced logistics readiness and interoperability,
- increased supportability and safety of systems and equipment, and
- reduced acquisition lead-time.

Unfortunately, realizing many of the benefits of parts management requires the ability to either link disparate databases or discover actionable information to answer the many questions that surface during the life cycle of a weapon system. The following are examples of questions that a program manager might have:

- *Standardization*. If MIL-A-8625 were to be changed or canceled, what is the overall impact on the F-15 Eagle?
- *Part obsolescence*. If a manufacturer no longer supplies an o-ring that conforms to military specification MIL-P-25732C, how does that affect my ability to support my weapon system?
- *Quality/safety*. If, on the F-14, a certain titanium bolt that was tested under MIL-B-87114 fails, what other items on this weapon system were tested using that standard so I can order an inspection?
- *Material information inferred from standards*. If there is a shortage or disruption in the supply of Aluminum 2024, how many of my weapon system national stock numbers (NSNs) are affected?

Those questions can be answered from information available in public and military data sources, but getting that information is manually intensive and difficult because it may be buried in narrative text in legacy databases and documents. To help answer such questions, the Defense Standardization Program Office (DSPO) undertook the development of an automated, web-based system—the Weapon System Impact Tool (WSIT).

Genesis of WSIT

In September 2001, the DSPO Weapon System Integrated Product Team (IPT) stated that "In today's Standardization business process, a difficult manual search is required to determine the effect of standardization documents on major weapon systems (i.e., to determine which standardization documents apply to which weapon systems and their components)." At that time, no easy-to-use, automated system was available to provide the correlation between standardization documents and weapon systems that key players in the standardization community and program offices require. The military services and the Defense Logistics Agency (DLA) had various software tools to capture some of the information necessary to establish the correlation. However, those tools relied on manual interrogation by individual part number or NSN.

The IPT also emphasized that maintenance and support of fielded weapon systems require regular and sustained interaction among original equipment manufacturers (OEMs), DoD program management offices, engineering support activities, logistical inventory control points, and standardization offices. A significant number of interactions coalesce around various types of requirements documents (OEM- and subcontractor-unique specifications, drawings, part numbers, and DSP specifications). DSP specifications constitute a significant portion of all specifications used to describe weapon system repair parts.

In response to the IPT's evaluation, DSPO established the WSIT program. DSPO developed an initial (pre-production prototype) automated WSIT system in 2003 and brought it to a community of 50 users as a WSIT website. The WSIT system is driven by information in the DLA Coherent View database. The database contains data extracted from the free-text descriptions found in DLA legacy systems. In addition to specification and platform information, the Coherent View database includes technical attributes about parts and suppliers.

After a trial period, DSPO extended and improved the pre-production WSIT website, then deployed it as a full production system. Features were added to the website to give users the ability to view the underlying data from which document numbers and weapon systems were extracted. In addition, the process of generating the Coherent View database was upgraded to improve accuracy and reduce the cost of ownership. Finally, in late 2004, government users of the Acquisition Streamlining and Standardization Information System (ASSIST) were given access to the WSIT website through an automated link on the ASSIST website.

Technology Behind WSIT

Starting in 1999, the DLA Logistics Research and Development program invested in the development of advanced software technologies for mining and reasoning about jargon-rich unstructured free text. The outcome of this investment was a text reasoning and extraction system based on XSB Tabled Logic Programming, a powerful open-source artificial intelligence technology originally developed

with funding provided by the National Science Foundation. This system was created by XSB, Inc., a small software company that creates custom applications using the core XSB technology. DLA funds XSB to generate the Coherent View database (created by using XSB's extraction techniques to find information in free-text legacy data sources and to structure it in a relational database). DSPO has funded XSB to refine the Coherent View database and develop the WSIT website using Coherent View data.

A key feature of WSIT is that it contains information that was previously impossible to discover without a human reading notes stored in a legacy system one NSN at a time. Obviously, this manual approach is not a scalable solution, especially when you consider, for example, that the F-15 weapon system contains 90,606 DLA-managed NSNs that reference 9,750 specifications. To illustrate the point, consider NSN 4710-00-289-2782. DLA has three main legacy systems that "feed" WSIT with raw information. The first legacy system, managed by the Defense Logistics Information Service, is called the Federal Logistics Information System (FLIS). "The FLIS is the primary computer system through which all users access, store, and retrieve necessary information related to an item of supply, and is generally considered the database of record."[2] Basically, the FLIS contains cataloging information that describes the item. This description is articulated via a combination of a structured database and narrative textual information. As an example, Table 1, from FLIS, shows the technical characteristics for NSN 4710-00-289-2782. The "End Item Identification" property for this part tells us that it is used on the F-15. This information is easy to see when reading the table but hard to retrieve with standard database queries.

The second legacy system is the Standard Automated Material Management System (SAMMS). SAMMS is the operational legacy system that DLA uses to manage all DLA items. Basically, SAMMS contains buying, supplying, technical, and financial information in a combination of structured and

TABLE 1. FLIS Table Showing Technical Characteristics for NSN 4710-00-289-2782.

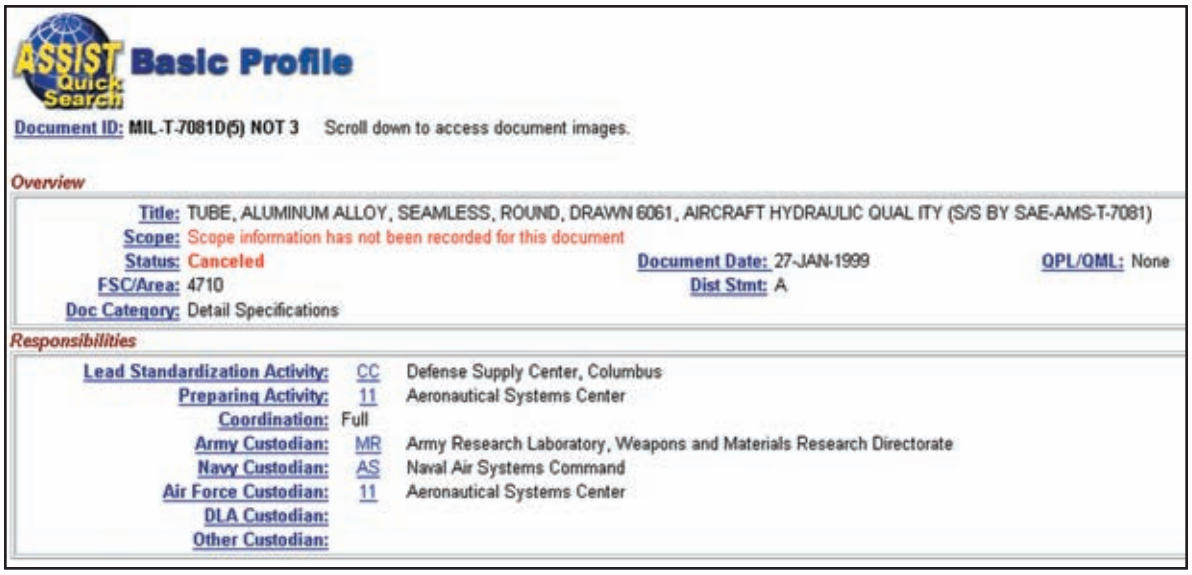
MRC	PROPERTY	CLEAR TEXT REPLY
AAGR	Cross-Sectional Shape Style	1 Plain Round
AAGT	Wall Thickness	0.049 Inches Nominal
AAGZ	First End Style	1 Plain
ABMZ	Diameter	0.250 Inches Nominal
AEHZ	Maximum Operating Temp	Not Rated
AGAV	End Item Identification	Aircraft, Eagle F-15
CQBB	Second End Relationship with First End	Identical
CQCF	Construction	Seamless
CQGM	Maximum Operating Pressure	3000.0 Pounds Per Square Inch
CRTL	Criticality Code Justification	FEAT
CRXX	Measuring Method And Length	120.000 Inches Minimum Random
CRXX	Measuring Method And Length	144.000 Inches Maximum Random
FEAT	Special Features	Weapon System Essential
HEAT	Heat Treatment	T-6 Solution Heat Treated and Artificially Aged
NAME	Item Name	Tube, Metallic

free-text information. Continuing our example, the following is the SAMMS Contractor Technical Data File (CTDF) Procurement Item Description (PID) for NSN 4710-00-289-2782:

> TUBE, ALUMINUM ALLOY. SEAMLESS, TEMPER T6, COMPOSITION 6061, 0.250 IN. OD, 0.049 IN. WALL THK, 10 FT. THROUGH 12 FT. RANDOW LG, PLAIN ENDS MIL-SPEC. TITLED, TUBE, ALUMINUM ALLOY, SEAMLESS, ROUND, DRAWN 6061 AIR-CRAFT HYDRAULIC QUALITY. AMS-T-7081 (MIL-T-7081) IS THE ONLY ACCEPT-ABLE MATERIAL, SUBSTITUTIONS ARE NOT PERMITTED.

Although the CTDF is structured as a relational database, the PID is stored in this database with each line of text as a separate record. Reading the PID, we can see that this part is controlled by specification AMS-T-7081, which replaced MIL-T-7081. Again, this information would be difficult to obtain using standard database queries.

The third legacy system is ASSIST, a DSPO-funded website that presents information on publicly available government and non-government standards and specifications. Let's look at what ASSIST shows for AMS-T-7081 and MIL-T-7081, which control the F-15 part in our example. Using the ASSIST quick search for AMS-T-7081 returns no results, but searching for MIL-T-7081 displays the following:



We can see from the title of this specification that this part is a drawn seamless round tube made out of Aluminum Alloy 6061 and that this specification is superseded by SAE-AMS-T-7081. Again, obtaining this information requires human understanding of the presented text.

Clearly, manually combining the rich information in FLIS, SAMMS, and ASSIST is tedious. However, WSIT does this automatically, presenting a coordinated picture of the relation between standardization documents and weapon systems.

WSIT's XSB technology uses advanced artificial intelligence and parsing techniques to structure legacy information in the Coherent View database. Thus, by using queries, weapon system program managers can easily access a lot of useful information in the legacy systems. More important, WSIT

can present much more useful knowledge based on the extracted information. For instance, not only does WSIT tell us that SAE-AMS-T-7081 controls NSN 4710-00-289-2782, an aluminum tube on the F-15, but it also quickly reveals that this specification is associated with 24 NSNs on this aircraft. In addition, it reveals that the F-15 has 166 parts referencing MIL-T-7081, which the SAE specification supersedes. Therefore, a program manager would learn that a change to this specification could have a significant impact on F-15 readiness.

A Closer Look at WSIT

An individual can gain access to the WSIT in one of two ways:

- *Through the ASSIST website.* If you are a DoD employee with a .mil e-mail extension, you will have access through ASSIST. If you do not have a .mil extension, but believe that you need access to WSIT, you can request special permission granting you access via the registration form on the ASSIST website.
- *Through the WSIT website.* You can log on to the WSIT website directly and, if you have permission, you can have access. If you do not have permission, you can request access with appropriate justification.

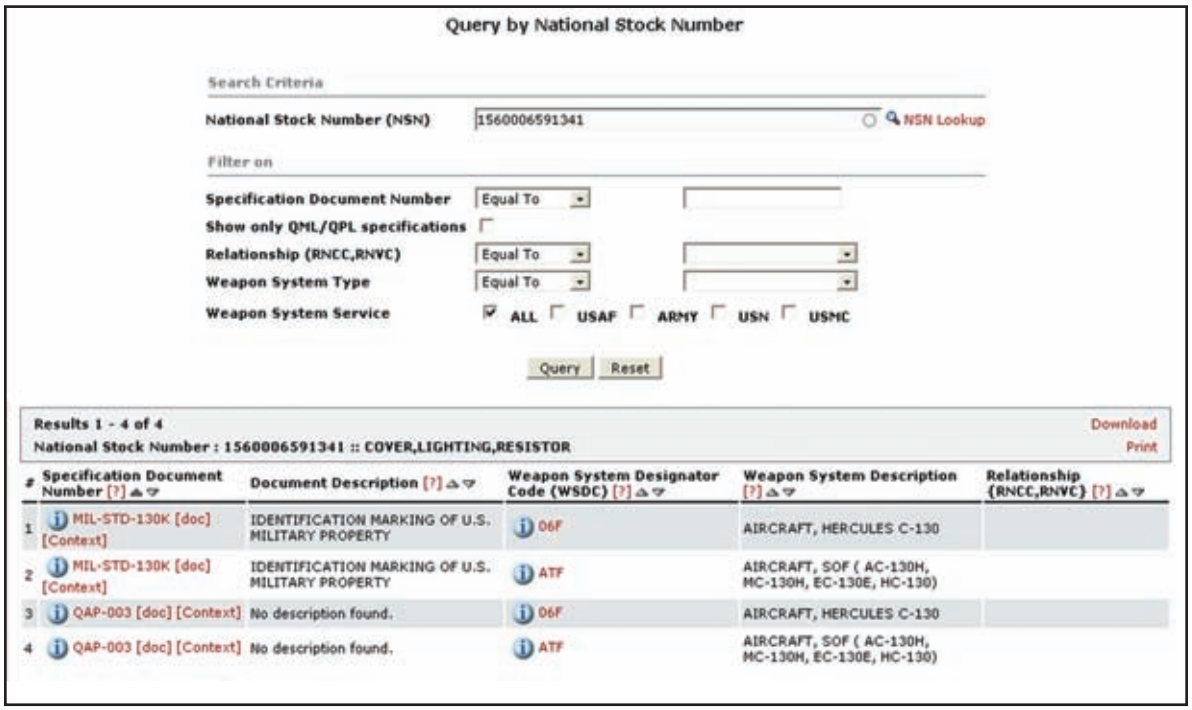
After logging on to the WSIT website, you will be connected to the following screen, which presents the queries WSIT supports:

WSIT allows four different ways to explore the relations between standardization documents, parts, and weapon systems:

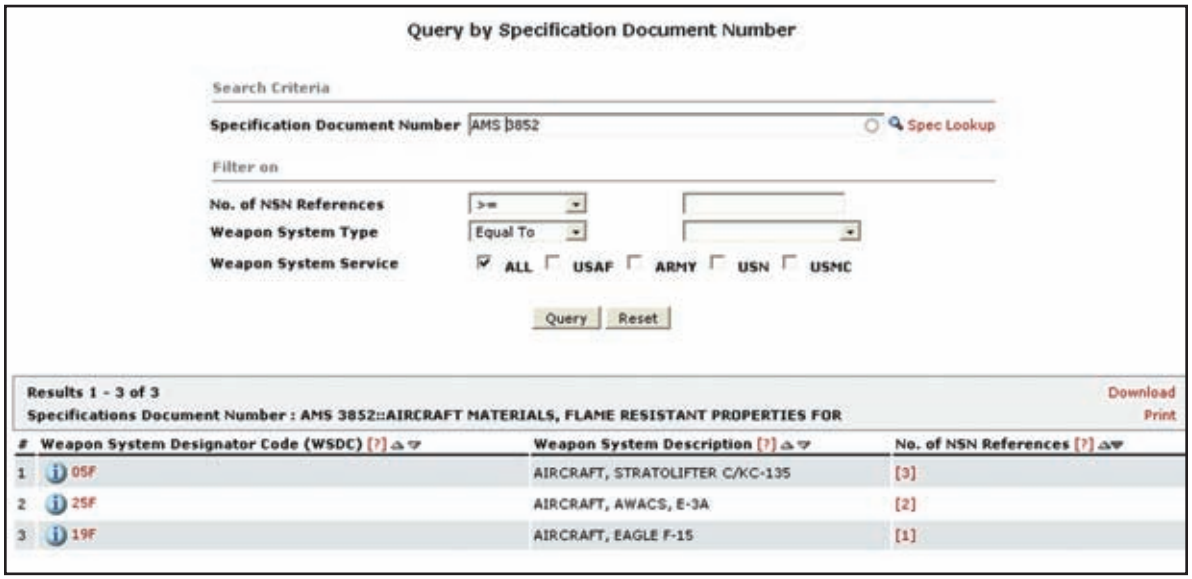
- Query by NSN
- Query by specification document number
- Query by Weapon System Designator Code (WSDC)
- Query by specification and WSDC.

We will examine each of these.

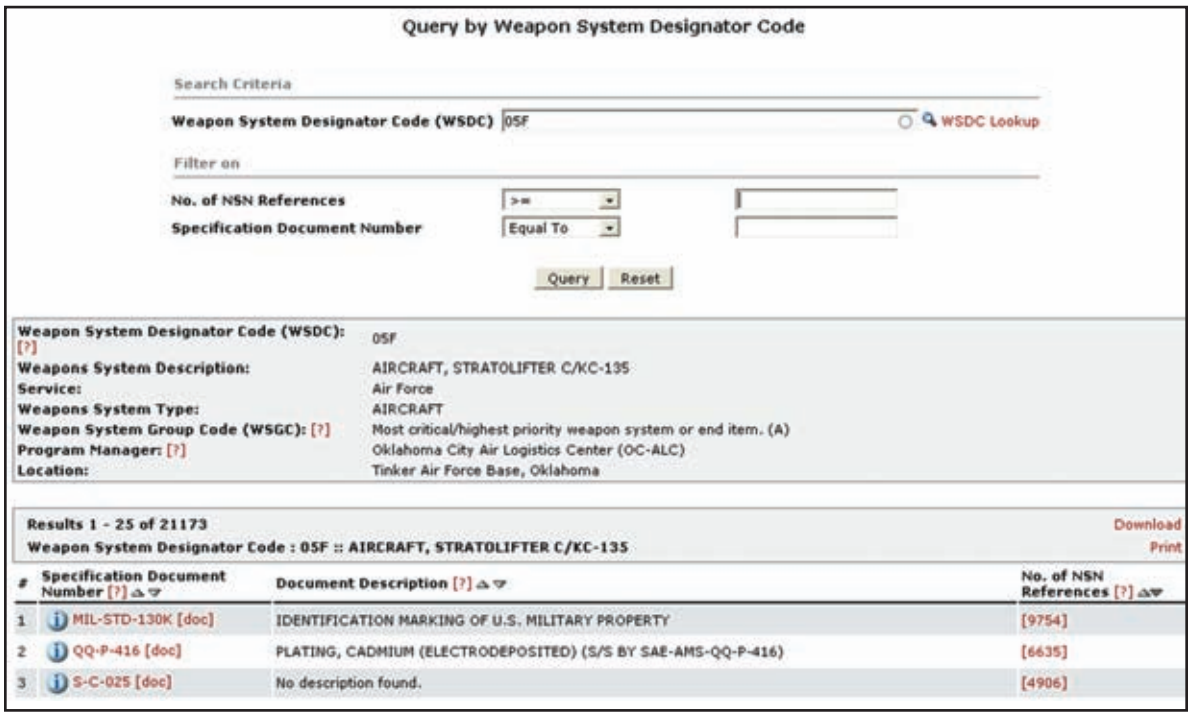
The first method queries on NSN, which allows the user to view all weapon systems in which the NSN is used, along with the specification document governing the NSN's use. The following screen shot shows the results for a typical NSN query:



The second query supported by WSIT is a query on a specification or standard document. Query by specification document number allows the user to view all weapon systems affected by a specification or standard. In addition, this query shows the count of NSNs in each weapon system covered by that specification or standard. Typical results of this type of query are shown below:



A third WSIT query method is querying by weapon system using the WSDC. This query returns a list of specifications that affect the queried weapon system and the number of NSNs on that weapon system that are affected. The following is a typical example:



Query by Weapon System Designator Code

Search Criteria

Weapon System Designator Code (WSDC) 05F — WSDC Lookup

Filter on

No. of NSN References >=

Specification Document Number Equal To

Query Reset

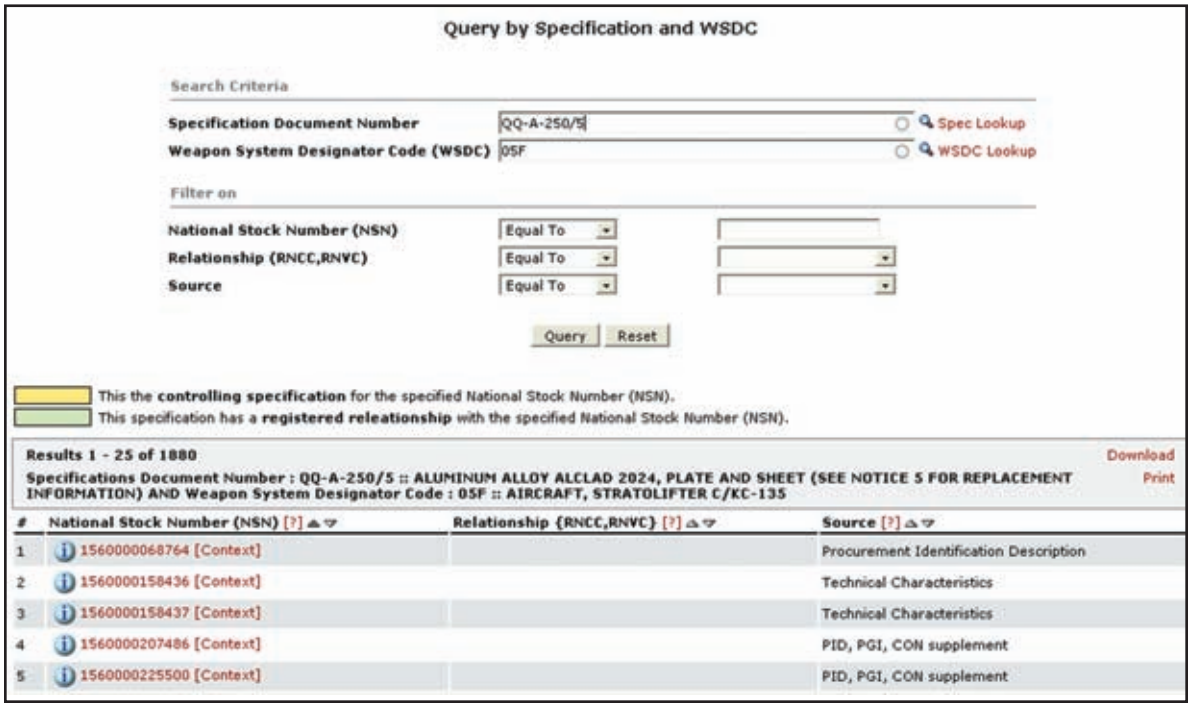
Weapon System Designator Code (WSDC): [?]	05F
Weapons System Description:	AIRCRAFT, STRATOLIFTER C/KC-135
Service:	Air Force
Weapons System Type:	AIRCRAFT
Weapon System Group Code (WSGC): [?]	Most critical/highest priority weapon system or end item. (A)
Program Manager: [?]	Oklahoma City Air Logistics Center (OC-ALC)
Location:	Tinker Air Force Base, Oklahoma

Results 1 - 25 of 21173 — Download Print

Weapon System Designator Code : 05F :: AIRCRAFT, STRATOLIFTER C/KC-135

#	Specification Document Number [?]	Document Description [?]	No. of NSN References [?]
1	MIL-STD-130K [doc]	IDENTIFICATION MARKING OF U.S. MILITARY PROPERTY	[9754]
2	QQ-P-416 [doc]	PLATING, CADMIUM (ELECTRODEPOSITED) (S/S BY SAE-AMS-QQ-P-416)	[6635]
3	S-C-025 [doc]	No description found.	[4906]

Finally WSIT supports a query by both weapon system and specification. A query for weapon system and controlling specification yields a list of all NSNs in the weapon system affected by the specification. Here is an example query result:



Query by Specification and WSDC

Search Criteria

Specification Document Number QQ-A-250/5 — Spec Lookup

Weapon System Designator Code (WSDC) 05F — WSDC Lookup

Filter on

National Stock Number (NSN) Equal To

Relationship (RNCC,RNVC) Equal To

Source Equal To

Query Reset

This the **controlling specification** for the specified National Stock Number (NSN).

This specification has a **registered releationship** with the specified National Stock Number (NSN).

Results 1 - 25 of 1880 — Download Print

Specifications Document Number : QQ-A-250/5 :: ALUMINUM ALLOY ALCLAD 2024, PLATE AND SHEET (SEE NOTICE 5 FOR REPLACEMENT INFORMATION) AND Weapon System Designator Code : 05F :: AIRCRAFT, STRATOLIFTER C/KC-135

#	National Stock Number (NSN) [?]	Relationship (RNCC,RNVC) [?]	Source [?]
1	1560000068764 [Context]		Procurement Identification Description
2	1560000158436 [Context]		Technical Characteristics
3	1560000158437 [Context]		Technical Characteristics
4	1560000207486 [Context]		PID, PGI, CON supplement
5	1560000225500 [Context]		PID, PGI, CON supplement

WSIT makes it very easy to switch back and forth among these queries. It also provides links to the original data on which the query answers are based. Clicking [Context], the field next to an NSN, displays the FLIS or SAMMS source document where a relationship was found between that NSN and a specification or weapon system. Clicking [doc], the field next to a specification, displays that specification's information page in ASSIST.

Conclusion

With WSIT, program managers are now in a position to obtain some of the answers to the weapon system management questions posed in the introduction:

- MIL-A-8625 affects more than 1,700 parts on the F-15 Eagle.
- Parts conforming to MIL-P25732C are used on 639 different weapon systems.
- Ten NSNs on the F-14 are subject to MIL-B-87114.

DSPO recognizes that WSIT requires further refinement. Some information is not yet available on WSIT. You can't yet find which parts are o-rings from a specific manufacturer. You also can't find all the specifications referencing Aluminum Alloy 2024. This information is available in the Coherent View database but has not yet been integrated into the WSIT queries.

WSIT also needs expanded functionality. Adding functionality is possible because of WSIT's underlying technology and flexible architecture. However, DSPO is not familiar with all the challenges that face program managers; we don't know the myriad questions that you need to ask or that are asked of you. If you would like to request added functionality, use the feedback button on the WSIT website. Your feedback will help determine the future features and information that will be added to WSIT.

If you would like access to the system, please e-mail your name, organization, telephone number, and e-mail address to Ronald.Zabielski@dla.mil.

[1]Defense Supply Center Columbus, Parts Standardization and Management Committee, *Reduce Program Costs Through Parts Management*. Available at http://www.dscc.dla.mil/Programs/psmc/psmc_library.html.

[2]Under Secretary of Defense for Acquisition, Technology and Logistics, *Federal Logistics Information System (FLIS) Procedures Manual*, DoD 4100.39-M, Vol. 1, Section 1.1.5.

About the Author

Ron Zabielski is a member of the Defense Standardization Program Office staff.

May 23–25, 2006, Arlington, VA

Defense Standardization Program Outstanding Achievement Awards Ceremony and Conference

The Defense Standardization Program Outstanding Achievement Awards Ceremony and Conference will be held May 23 through May 25, 2006, at the Westin Gateway Hotel in Arlington, VA. The Westin Gateway Hotel is accessible by metro and is close to National Airport, the Pentagon, and Washington, DC. Rooms will be offered at the government per diem rate.

This year's event will be administered by the Society of Automotive Engineers (SAE) and promises to be top notch in every respect. Although details are still being worked out, there will be a Standardization Executive Panel, discussion of the new policies regarding Joint Standardization Boards as well as presentations from some of the boards, tutorials on enhanced automation capabilities, new directions for the parts management program, an update on the future direction for DoD 4120.24-M, and much more. For more information, go to http://sae.org or http://dsp.dla.mil, or call 703-767-6870.

Farewell

Ronald Bayless, director of the Operations Support Group at the Defense Supply Center Columbus (DSCC), will be retiring January 3, 2006, after nearly 50 years of federal service (about 25 years in the Air Force and 25 years working for the Defense Contract Management Agency under the Defense Logistics Agency. Since January 1994, Mr. Bayless has had the management responsibility of ensuring the proper implementation of defense standardization programs (product qualification, specification preparing activity, parts management, etc.) at DSCC.

Welcome

Rebecca Harris was installed as the new Standardization Executive for the Defense Information Systems Agency (DISA), replacing Dr. Jeremy Kaplin. Ms. Harris began her government service with the U.S. Army Computer Systems Command. She joined DISA in 1991 to work in the DoD Data Administration Program Management Office. During her tenure at DISA, she has served in a variety of roles. Her most recent is principal director of Global Information Grid (GIG) Enterprise Services Engineering, with responsibility for planning, engineering, acquiring, and integrating joint, interoperable, and secure global net-centric enterprise capabilities for the GIG.

Dana Granville has been assigned as Standards Executive and senior materials engineer for the Materials Application Branch of the Weapons and Materials Research Directorate of the U.S. Army Research Laboratory (ARL), Aberdeen Proving Ground (APG), MD. Mr. Granville has more than 30 years of experience working with thermoplastic and thermosetting, and in his last position, was responsible for the footprint design and acquisition of all major equipment for ARL's new composites laboratory at APG. Mr. Granville currently serves as chair of the DoD Manufacturing Technology Composites

Processing and Fabrication Subpanel, is deputy to the Army Principal for the DoD Project RELIANCE Technical Panel for Advanced Materials, and co-chairs the five-volume MIL-HDBK-17 (*Composite Material Handbook*) program with the Federal Aviation Administration. He serves as a trustee for the Plastics Institute of America, is an officer of the Society for the Advancement of Material and Process Engineering, and is a member of the Society of Plastics Engineers and the *Journal of Advanced Materials* editorial board.

Mary Koons recently has rejoined the Technical Branch, Supplier Support Division, DSCP-FTSL, at Defense Supply Center Philadelphia. She will fill a major void, especially in New Item Establishment and SAP Tech/QA Master Material data resolution.

Jim Crum, formerly the relay standardization engineer in DSCC's Preparing Activity organization, the Document Standardization Unit, was promoted to team chief of DSCC's Parts Support Management Team in the Standardization Unit, which is responsible for executing the DoD Parts Management and Item Reduction programs.

Thomas Nguyen recently joined DSCC's Preparing Activity organization. He is replacing Mr. Crum as DSCC's relay standardization engineer.

Upcoming Issues—
Call for Contributors

We are always seeking articles that relate to our themes or other standardization topics. We invite anyone involved in standardization—government employees, military personnel, industry leaders, members of academia, and others—to submit proposed articles for use in the *DSP Journal*. Please let us know if you would like to contribute.

Following are our themes for upcoming issues:

Issue	Theme
April–June 2006	DLA Standardization
July–September 2006	Civil Agency Standardization
October–December 2006	Joint Standardization Boards
January–March 2007	IT Standardization

If you have ideas for articles or want more information, contact Tim Koczanski, Editor, *DSP Journal*, J-307, Defense Standardization Program Office, 8725 John J. Kingman Road, Stop 6233, Fort Belvoir, VA 22060-6221 or e-mail DSP-Editor@dla.mil.

Our office reserves the right to modify or reject any submission as deemed appropriate. We will be glad to send out our editorial guidelines and work with any author to get his or her material shaped into an article.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