Defense Standardization Program

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Defense Standardization Program
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In this issue of the *Defense Standardization Program Journal*, we will be focusing on the many standardization efforts and initiatives currently underway at the Defense Logistics Agency. The final, of a four-part series that included the Army, Navy, and Air Force, it is my pleasure to turn over my column to Ms. Christine Metz, the Defense Logistics Agency Standardization Executive. I hope you enjoy reading about the good work being done by the Defense Logistics Agency and seeing how some of their standardization successes might apply to you.

Gregory E. Saunders
Director, Defense Standardization Program Office

Message from the Defense Logistics Agency Standardization Executive

By Christine Metz
Defense Logistics Agency Standardization Executive

As the Defense Logistics Agency Standardization Executive, I view standardization in the context of what it can do to help the Defense Logistics Agency (DLA) better serve the needs of the warfighters, and the standardization program is a key enabler to help DLA meet this goal.

Our experience at DLA shows that those items of supply that are described by a standardization document, whether it be a specification, a commercial item description, or a non-government standard, have shorter customer wait times and a higher supply materiel availability than the ones not described by a standardization document. As the combat logistics support agency, DLA provides worldwide logistics support to the missions of the military departments and the unified combatant commands under conditions of peace and war. To this end, standards enable DLA to increase its availability and support for around-the-clock service to our military departments and the unified combatant commands. Standards also enable the developers and the sustainers of the military weapon systems to reduce acquisition and sustainment costs through increased parts availability and economies of scale. The warfighters' maintenance efforts are made easier because standards contribute to interoperable and sustainable parts.

Over the past 2 years, DLA has exceeded performance records in virtually all key business areas: highest supply materiel availability, lowest customer wait times, and lowest cost recovery rates. In fact, standardization has contributed to these successes. Despite these achievements, DLA is pressing forward with transformational change of its logistics support. As the

Christine Metz
Defense Logistics Agency Standardization Executive

Defense Department's only combat logistics support agency, DLA has a broad-based, joint service mission. However, numerous governmental and commercial activities operate in, or at the margins of, DLA's mission area. If we do not preserve a strong, best-value edge, we will lose sales and the economies of scales that are critical to our pursuit to being the most effective and efficient provider.

To provide a focused direction for this transformational change, DLA developed its FY06–FY13 strategic plan and the Transformation Roadmap that commit DLA to dramatically improve warfighter support at a reduced cost, through business process reengineering, workforce development, technology modernization, and organizational change.

Transforming logistics is not an end state—but a continuous process for us. We are leaving behind our legacy business model and organizational structure. Our transformation objectives are to become

- a robust customer-focused agency with world-class military service and warfighter partnering capabilities,
- a manager and integrator of the supply chains with world-class commercial supplier partnering capabilities, and
- a single, fully integrated enterprise.

This transformation will fundamentally change DLA's core business model, supporting processes and systems architecture. A key component to the transformation is organizational alignment.

Over the past 2 years, DLA has exceeded performance records in virtually all key business areas: highest supply materiel availability, lowest customer wait times, and lowest cost recovery rates.

In the past, DLA operated as a traditional holding company, where its inventory control points and distribution centers reported to a centralized headquarters staff. The agency has taken the requisite strategic steps to establish a single, tightly integrated organizational structure where DLA will be viewed as one enterprise.

DLA has 13 key initiatives, which will transform its people, practices, and systems to better meet the warfighters' needs at reduced cost. I would like to focus on one initiative—Product Data Management Initiative (PDMI)—that directly impacts the agency's technical and quality business processes.

PDMI is DLA's strategy for transforming the agency's technical and quality business processes and associated capabilities. DLA's technical business processes are focused on identifying the "right item" to ensure customers get the correct part for their specific requirements in a timely, cost-effective, and reliable manner. The success and effectiveness of our technical business processes and ability to get the "right item" for our customers are largely dependent upon the quality, accuracy, and completeness of the technical or product data concerning an item. Product data include standardization documents, technical manuals, operating procedures, maintenance and support information, and the actual engineering drawings that are essential to designing, buying, using, and maintaining items of supply, including weapon systems parts. One of our largest efforts in maintaining quality product data is standardization documents. We have preparing activity responsibilities for management and maintenance of about 14,000, or 35 percent, of the 40,051 standardization documents in DoD's repository.

When complete, PDMI will deliver an enterprise-wide product data/product life-cycle management and collaboration system. It will deploy commercial off-the-shelf software and reengineered business processes adapted from recognized best practices. PDMI will provide the technical user

- a transformed, seamless, real-time flow of data and information that will enable significant improvements in process and data visibility;
- a single virtual workspace for all technical and quality users;
- enterprise-wide standardized integrated business processes;
- automated management of technical and product data; and
- visibility into all product and technical and quality data associated with DLA items.

When we incorporate the recommendations of the October 2005 DoD Parts Management Reengineering Working Group report against the DoD Parts Management Program, DoD Item Reduction Program, and DoD Interchangeability and Substitutability Program into PDMI, we believe that PDMI will enhance our support to those programs.

Supported by an effective standardization program, these improvements will enhance DLA's overall ability to respond to its customers and meet specific demands in a timely and cost-effective manner and, most of all, will fulfill our goal of "Right Item, Right Service, Right Place, Right Price, Right Time … Every Time." Ultimately, DLA will achieve a revolution in military logistics.

Lead-Free Challenges for Military Standard Parts

By David Moore and Robert Evans

MIL-PRF-38534E
APPENDIX C

C.6.3.2.2 Resistance to solvents. Each inspection lot of marking ink will be tested prior to acceptance in accordance with MIL-STD-883, method 2015. This series of tests will be performed on each type of surface which is used as the marking surface on completed devices (e.g., silver plate, abraded nickel plate, non-abraded nickel plate, etc.). One piece of each surface type will be tested in each solvent. Each week one device or element (lid or package) representative of each of the marking surfaces of each device marked during the week will be tested in accordance with MIL-STD-883, method 2015 except that only "solvent D" is required.

- C.6.3.2.3 Internal visual and mechanical. Internal visual and mechanical inspection will be performed at preseal visual inspection in accordance with the requirements of MIL-STD-883, method 2014. As a minimum, one device of each device type received at preseal visual inspection each month will be inspected.

- C.6.3.2.4 Bond strength. Wire bond strength in-line inspection will be performed as a part of wire bond certification and in accordance with MIL-STD-883, method 2011. Each wire bond process (i.e., thermosonic gold, ultrasonic aluminum, thermal compressions gold, etc.) will be tested weekly. Where more than one machine exists for a specific process, the test sample will be rotated between machines such that all machines are tested at least once during each 13 week period when in operation. At the time of certification, an additional minimum 10 wires total (15 wires for Class K) will be bonded in the certification sample part(s). After completion of certification bond pulls, the parts with the additional 10 wires (15 wires for Class K) intact will be preconditioned for 1 hour at +300°C minimum in either air or an inert atmosphere followed by destructive pull tests. Bond strength requirements (i.e., minimum pull forces) will be as specified in Table C-Xb-1. No failures are allowed.

- C.6.3.2.5 Die shear. Die shear testing will be performed on two devices as a part of group C inspection (i.e., first lot and any element attach changes). Die shear testing during group C will be performed in accordance with MIL-STD-883, method 2019.

- C.6.3.2.6 Solderability. Solderability testing will be performed as a part of incoming inspection (i.e., package evaluation) as follows:

  Packages will be temperature aged to one of the following conditions prior to performing the solderability test.

  6 ±0.5 hours at T_A = +250°C,±10°C

  22 ±1 hours at T_A = +200°C,±8°C

  160 ±8 hours at T_A = +150°C, ±6°C

- When the device process flow includes an operation in which the package lead finish is changed prior to delivery of the device (i.e., a solder coating is applied), this operation will be performed on the package evaluation sample packages subsequent to the temperature aging. Following the temperature aging (and the lead finish application, if applicable), the sample packages will be solderability tested in accordance with MIL-STD-883 Method 2003 including an 8-hour (± 0.5 hour) steam aging.

- C.6.3.2.7 Seal. Seal tests will be performed in accordance with MIL-STD-883, method 1014. One-hundred percent testing will be performed on all devices between final electrical test and external visual.

- C.6.3.3 Group C inspection. Group C inspection will be performed only on the first inspection lot submitted for inspection and as required to evaluate or qualify changes. Group C inspection will be performed in accordance with Table C-Xc under the PI column and as outlined herein. For QML qualification, refer to section C.7 of this specification.

NOTE: The qualifying activity may approve alternate test plans for small lots of devices for group C inspection.

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Recent trends in electronics have been to minimize the use of hazardous materials. A particular area of focus has been on the use of lead-based solders, typically, tin-lead (SnPb) solders. This article addresses issues related to the move, by the commercial electronics market, from lead-based solders to lead-free solders (LFSs) and the likely impact of that move on the standard electronic parts programs managed by the Defense Supply Center Columbus (DSCC). DSCC's perspective is from the specification preparing activity and qualifying activity for the defense specification programs. DSCC supports its military customers with more than 8,000 specifications and drawings of electronic parts. DSCC also provides a variety of spare parts to the military, including engineering drawing parts and commercial parts. Therefore, we also address the implications for military programs that have chosen to use commercial parts.

Background

In the last 3 to 4 years, the European and Japanese electronics sectors have begun a transition away from lead-based solders for electronics. In Europe, this move has been driven by legal and regulatory requirements associated with two European Union (EU) directives, one on waste electrical and electronic equipment and the other on restriction of the use of certain hazardous materials (RoHS). The former directive focuses on end-of-pipeline-type issues such as disposal, whereas the RoHS directive focuses on restricting the use of certain hazardous materials (such as lead) in product design and manufacture. (These EU efforts cover a variety of hazardous materials such as mercury, cadmium, hexavalent chromium, polybrominated biphenyls, and polybrominated diphenyls, as well as lead.) The RoHS directive will become law and be implemented as of July 1, 2006.

In Japan, the push to move away from lead-based solders is more market driven than regulatory driven as in Europe. Japanese electronic manufacturers view the use of LFSs as a market edge in selling their products, both in their home market and in other countries. The Japanese companies are leaders in commercial electronic products moving to LFSs.

The Chinese government also has undertaken an effort to develop an RoHS-type system for the Chinese market. The details and policies are being developed.

The United States has no regulatory requirement to restrict the use of lead-based solders in electronics. Although lead is controlled and precluded in the United States on many products (such as paint, plumbing, and gasoline), no such restriction currently exists for electronics.

A particular point of concern for the defense and aerospace industries, in both the United States and other countries, is the potential reliability implications of moving from lead-based solders to LFSs. Because of the unknown risks of using LFSs in these demanding applications, the EU has exempted its defense and aerospace industries (although this could change over time) from the directive restricting the use of lead-based solders.

Lead-Free versus Lead-Based Solders

The worldwide commercial electronics industry has devoted considerable resources to finding acceptable replacements for lead-based solders. Unfortunately, at this time, there does not appear to be a universal replacement, and the various replacements offered to date have both advantages and disadvantages. Many companies in Europe, Asia, and the United States are using the so-called SAC alloys, which consist of tin (Sn), silver (Ag), and copper (Cu). SAC 305 (Sn3.0Ag0.5Cu) and SAC 405 (Sn4.0Ag0.5Cu) are the most popular of these alloys.

The SAC solders melt at a much higher temperature than the traditional SnPb solders; SAC solders have a melting point around 217°C versus 183°C for SnPb. Therefore, they cannot be viewed as a replacement for or mixed with the current SnPb soldering technologies (e.g., as replacement parts). The higher soldering temperatures might also require that electronic parts be redesigned to survive the higher temperatures. In Japan, many companies are alloying the SAC solder with bismuth. This combination lowers the melting point temperature, but raises other issues relating to toxicity, pad lifting, brittle solder joints, and wetability.

Another popular LFS for electronics is solder with a high tin content (more than 97 percent) or a pure tin content. For many commercial applications, equipment contractors and component manufacturers have already switched to these tin finishes. However, pure tin finishes have long been known to suffer from a phenomenon in which tin "whiskers" grow and create short circuits on high-density boards and on low-voltage and small-geometry electronics components.

Reliability Problems with Pure Tin Finishes

The use of finishes with a very high or pure tin content has long been considered to pose a reliability problem, particularly by aerospace and defense users that have high-risk applications and long-life equipment. Many think that compressive stresses in the tin finish are the root cause of the problem. Industry associations such as the Government Electronics and Information Association are developing protocols and documents addressing the mitigation of the problem, but no definitive solutions have emerged to date that would allow broad use of such finishes.

Like the aerospace industry, DoD has long had concerns about the reliability of very high tin content and pure tin solders. In the early 1990s, NASA, the National Security Agency, and the Air Force Space and Missile Systems Center all requested that the former Defense Electronics Supply Center (now DSCC) prohibit the use of high tin content and pure tin finishes in the established reliability and high-reliability programs on electronic parts. After coordination with the defense industry and all of the affected military departments, these restrictions were adopted in hundreds of DSCC-managed specifications for electronic components (resistors, capacitors, filters, relays, semiconductors, microcircuits). Those specifications require a minimum lead content of 3 percent (in some cases, 2 percent) for SnPb solder finishes. That restriction remains in place to this day, and the high reliability and space users remain adamant that these restrictions remain in place.

Implications of the Move to Lead-Free Solders

The move to LFSs raises a number of interesting issues in the short term, as well as in the long term, relating to the defense specification programs for electronic parts. In the short term, the move to LFSs, occurring on commercial-type parts, does not seem to have affected the defense specification programs. Current suppliers of standard military parts will continue to supply tin-lead solders for the foreseeable future (barring future legislative mandates). Finishes with very high or pure tin content will continue to be prohibited unless the root cause of the tin whisker growth can be identified and mitigation methods developed to the satisfaction of military customers.

In the long term, the use of LFSs is expected to affect the standard parts programs. For example, the DoD Joint Group on Pollution Prevention has a Lead-Free Solder Project and is evaluating some alternative LFSs—particularly, the SAC solders—for use by DoD. If the SAC solders are determined to be effective for military and aerospace applications requiring high reliability, then the standard parts programs must react to provide these compatible finishes.

Configuration of Standard Parts with New Lead-Free Solders

If LFSs are eventually found acceptable for DoD applications, then configuration control of the new parts with LFSs will be essential. At this time, it is clear that, in inventories, repair actions, and new manufacturing, parts compatible with the LFSs must be kept separate from the tin-lead parts. This differentiation can occur by using new numbers for the parts that are compatible with LFSs.

Part numbers in existing defense specifications managed by DSCC fall into two categories: defense specifications in which the lead finish is already coded in the existing part number, and specifications in which the lead finish is not coded in the existing part number. The following are examples of defense specifications in which the lead finish is coded in the part number:

- MIL-PRF-38534 and MIL-PRF-38535 (hybrid and monolithic microcircuits) and associated standard microcircuit drawings. An example is 5962-9951001Q2A in which the "A" designates the lead finish of hot solder dip (which is an SnPb solder).

- MIL-PRF-55342 (chip resistors). An example is M55342H01BE00M in which the "B" designates the lead finish of hot solder dip (which is an SnPb solder).

Adding LFSs to these specifications will be straightforward; it would simply require a new code in the existing part number system.

Examples of defense specifications in which the lead finish is not currently coded in the part number are as follows:

- MIL-PRF-19500 (semiconductors). An example is JANTXV2N2222A.
- MIL-PRF-39016 (relays). An example is M39016/10-001L.

Adding LFSs to these defense specifications will present a greater challenge. The existing part number will be redefined to specify the current lead finish in use (typically, an SnPb lead finish). To cover LFSs, a new code can be added to the end of the existing part number to differentiate the new LFS part from the non-LFS part.

Another issue, which has already arisen, is the fact that some device manufacturers are using proprietary LFS alloys. Typically, information about the alloys is available only from the supplier, and the customer may have to sign a nondisclosure statement. The use of proprietary alloys would not be acceptable for the DSCC-managed defense specifications, because it would be impractical for defense equipment contractors and for the DSCC spares sustainment mission.

The use of LFSs will also drive changes to solderability and resistance to soldering heat tests, particularly for the higher temperature SAC solders. DSCC is already participating in a draft revision of the industry standard on solderability, J-STD-002 ("Solderability Tests for Component Leads, Terminations, Lugs, Terminals and Wires"), which is being modified to address LFSs, specifically, the SAC solders. The introduction of SAC solders, which have a higher melting point, will require some level of requalification of part designs to verify compliance with the new high-temperature protocols.

Other Concerns

The DoD acquisition reform effort that began in the 1994 time frame gave contractors much more flexibility to use commercial and modified commercial parts in military applications. Now, with the drive in the commercial marketplace to move to LFSs, many commercial parts suppliers are shifting from tin-lead solders to pure tin solders. Unfortunately, some of these commercial parts may have found their way into military and aerospace applications.

Two scenarios arise:

- The parts manufacturer changes the existing part number to reflect the switch, usually to pure tin. The unavailability of the SnPb solder is still an issue, but at least customers are aware of the change and can plan accordingly.
- The parts manufacturers do not change the existing part number, and the part that was previously SnPb is now pure tin. The customer gets no visibility of the issue and may continue to buy the part expecting SnPb but getting pure tin instead, with the consequent reliability risks.

The following are possible mitigation efforts for commercial parts:

- Contract clauses requiring identification of parts with pure tin or prohibiting the use of pure tin
- Inspection of incoming parts using techniques such as x-ray fluorescence
- Redip pure tin leads with a tin-lead alloy using third parties that specialize in redipping leads.

Summary

Supplanting SnPb solders with LFSs poses many issues—notably, reliability—for the defense specifications electronic parts programs. Therefore, in the short term, customers requiring high reliability will continue to prohibit the use of pure tin finishes. When, and if, defense applications begin requiring LFSs, the defense specifications can be modified, using new part numbers to differentiate between lead-free and lead-based finishes. The defense specification programs will also need to verify the ability of the new LFS parts (for example, those using SAC solders) to meet demanding military environments and higher soldering temperatures.

For military users that have selected commercial parts for military applications, we offer a caveat. Do not assume visibility of LFS use in parts. Part numbers do not necessarily differentiate solder content. Furthermore, many commercial parts suppliers have switched to pure tin solders, which pose a reliability concern because of tin whisker growth.

About the Authors

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A Proposed Strategy for Standardizing Power Sources

By Adele Ratcliff, John Thompson, and Jim Gucinski

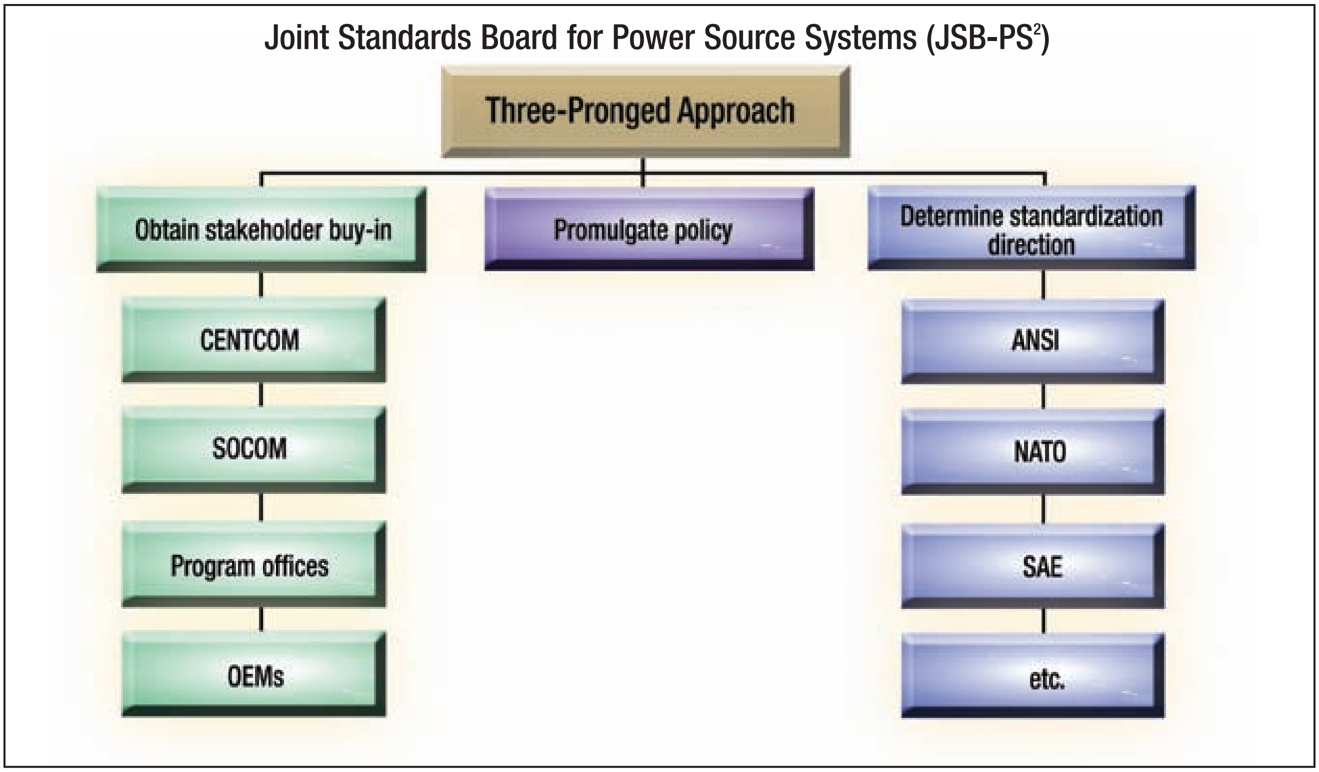
Warfighters should not have to make tradeoffs between carrying food, water, and ammunition and carrying additional batteries to power night vision devices, global positioning systems, target designators, radios, force multiplier devices, and other items. However, they sometimes must make such tradeoffs because power sources have not been designed to be interchangeable with different types of equipment. This problem is further compounded by the fact that each service has its own unique equipment and power sources. In fact, the Defense Logistics Agency (DLA) manages more than 4,500 different power sources. The different types of batteries pictured on the opposite page represent less than 10 percent of the power sources managed by DLA.

The lack of battery standardization and compatibility is costly. Logistically, there are significant costs associated with managing and procuring all the various types of batteries. There are redundant storage and maintenance costs for batteries with unique requirements, and there are disposal costs associated with environmentally harmful chemicals. But the most important cost occurs when military personnel don't have the right power source when they need it.

It is clear that power sources must be standardized. However, accommodating aging deployed systems within the standardization envelope is difficult, frustrating, and all too often expensive. One solution that has been attempted is to design an adaptor cable that would allow multiple uses for batteries currently in the inventory. However, this solution has its own problems (for example, adaptors are prone to being misplaced) and hasn't proven successful. Another approach is to review the legacy equipment and identify power sources that might be candidates for a standardization effort; this effort could prove worthwhile if the supported systems are expected to be in the inventory for an extended period. Nevertheless, standardizing those power systems for legacy equipment will be difficult.

We believe that the most practicable approach to standardizing power sources is to focus on power sources for new equipment. The U.S. Army Communications-Electronics Command (CECOM) has already been successful using that approach, limiting the proliferation and development of single-purpose power sources. In the mid-1980s, CECOM managed 440 unique batteries. As new equipment replaced older, obsolete systems, the Army was able to reduce the number of batteries managed to 12 standard types. By the late 1990s, the Army had established a policy focused on selecting batteries for new applications in a prioritized order beginning with commercial batteries, then 5 preferred types, then 12 standard types. A new battery could be developed only with authorization from senior Army command.

FIGURE 1. Three-Pronged Standardization Strategy



Considering CECOM's lessons learned, the key to standardizing power sources for new equipment is for DoD to establish a set of systematic procedures and processes for selecting power sources and an enterprise-wide technology management approach for viable power source candidates.

The Joint Standards Board for Power Source Systems (JSB-PS^2) has proposed a three-pronged approach for improving the battery selection and management process DoD-wide. This approach is predicated on the use of families of standardized batteries in the design of new systems. There may be some spillover effect with legacy systems and their power sources, but that is secondary to new system design.

The approach proposed by JSB-PS^2 is as follows:

- *Obtain stakeholder buy-in.* Stakeholder buy-in is essential. The U.S. Central Command, U.S. Special Operations Command, program offices, and original equipment manufacturers all must recognize the need for standardizing power sources. They also must recognize that, although the cost of an individual power source may increase, this additional cost is far outweighed by lower total ownership costs and the increased availability of equipment to the warfighter due to the interchangeability of power sources.
- *Promulgate policy.* DoD needs to establish policy that clearly defines the requirement for using standardized power sources. In addition, the policy needs to address the use of non-standard power sources. For example, DoD might determine that the use of a non-standard power source or non-standard interface should require a senior-level service manager to make a recommendation for approval by the Office of the Secretary of Defense (OSD) Standardization Manager. This is similar to the Army's guidance.
- *Determine the standardization direction.* In other words, DoD must determine how the power sources should or can be standardized, consider-

ing technological advances and trends in system development, to ensure maximum interchangeability—within each service, between services, and with our allies. This effort will require the input of power source experts from government (defense and civil) agencies, industry, and academia. Other key sources of input are the national and international standards-developing organizations such as NATO, the American National Standards Institute (ANSI), and the Society of Automotive Engineers (SAE).

The JSB-PS^2 is a key forum for moving forward with the standardization of power sources. This group can recommend projects and serve as an advisory commission to the OSD Standardization Manager. In addition, members of the JSB-PS^2 can provide a presence in commercial organizations such as ANSI and SAE. They also can serve on NATO teams dealing with power system standardization, ensuring U.S. interoperability with NATO forces. Together, these organizations can ensure that future warfighters never have to make the tradeoffs between batteries and the other basics that today's warfighters must make.

About the Authors

Adele Ratcliff is the oversight executive of the Manufacturing Technology Program within the Office of Technology Transfer, Office of the Secretary of Defense. Previously, she headed the Defense Acquisition Challenge Program and was the deputy program manager of the OSD Foreign Comparative Test Program.

John Thompson is the program manager for the Next Generation Manufacturing Technology Initiative, Power Sources and Special Projects, Defense Supply Center Richmond. He also chairs the DoD Power Sources Technology Working Group and the Joint Standards Board for Power Source Systems.

Jim Gucinski is a program manager at Tiburon Associates. Previously, he was the Power Systems Executive Agent for Naval Surface Warfare Center, Crane Division. Mr. Gucinski has more than 35 years of experience in the power sources field and either chairs or is a member of multiple national and international committees working in this field.

About the Joint Standards Board for Power Source Systems

The mission of the JSB-PS^2, as delineated in its charter, is as follows:

- Provide senior-level—Under Secretary of Defense for Acquisition, Technology and Logistics—visibility for standardization and interoperability initiatives
- Establish DoD standards (in accordance with DoD 4120.24-M, "Defense Standardization Program, Policies and Procedures") or non-government standards as applicable
- Improve interoperability of joint and coalition forces
- Recommend joint doctrine, tactics, techniques, and procedures
- Establish standardization of parts and components that have lower cost, reduced inventories, shortened logistics chains, and improved readiness
- Develop joint solutions to issues that impact the power source systems domain
- Propose funding requirements for specific efforts and projects related to standardization and interoperability goals and objectives
- Provide the interface for commercial and military integration.

The JSB-PS^2 is composed of members from each service branch, the Missile Defense Agency, and DLA, as well as representatives from industry and academia. For further information, contact Adele Ratcliff (Adele.Ratcliff@osd.mil) or John Thompson (John.M.Thompson@dla.mil).

Changing from Green to Purple
Transitioning Specifications for U.S. Army C-E Batteries to DLA

By Ron Cialino and John Thompson

Imagine these scenarios: A downed F/A-18 Navy pilot calls for search-and-rescue support; an Army Ranger team performs nighttime surveillance on a suspected terrorist camp; a Marine unit sets out chemical agent alarms along the perimeter of base camp; an Air Force Special Forces team sets up a temporary landing strip behind enemy lines using battery-powered landing lights for covert night landings. What do these missions have in common? They all depend on battery power to operate. Commonly referred to as communications-electronics (C-E) batteries, these power sources are used to operate the radios, night vision devices, thermal imagers, chemical alarms, and emergency lighting equipment that are crucial to military operations. C-E batteries come in both rechargeable and nonrechargeable forms.

Over the past 18 months, the Defense Logistics Agency (DLA) has teamed with the U.S. Army Communications-Electronics Command (CECOM) to ensure that the batteries are available when needed and will support mission requirements without fail. DLA's expertise in procurement and manufacturing, combined with CECOM's technical expertise in C-E power sources, has made the effort a success. Since October 1, 2004, DLA has served as the Integrated Materiel Manager for a family of high-performance C-E batteries, formerly managed by the U.S. Army's Communications-Electronics Life Cycle Management Command (C-E LCMC). C-E LCMC has shared its technical expertise with DLA to ensure that batteries perform as designed and that future power technologies will support evolving man-portable electronics used in combat. This DLA and Army partnership characterizes a joint-service collaboration—often referred to as a "purple" approach—to meeting the warfighter's needs.

Warstoppers: Applying a Proven Tool to Solve Problems

One of the first benefits of the collaboration came from the application of "warstopper" items to the C-E battery industry. DLA has applied the Warstoppers program in other essential procurements, such as medical supplies, to preposition critical components and tune manufacturing processes to assist with meeting wartime surge requirements. The Warstoppers program is designed to help alleviate shortages caused by accelerated war demands that exceed war-reserve stock, providing manufacturers the time they need to increase production to meet the new demand.

LEAN: Getting the Best from Manufacturing

Another joint effort is the application of LEAN to the processes used by C-E battery manufacturers. The LEAN Battery Initiative (LBI) is the result of a DoD Battery Manufacturing Gap Study (BattMan), completed in FY04, that identified potential supply problems related to two types of batteries used during Operation Iraqi Freedom: BA-5390 ($LiMnO_2$), and BA-5590 ($LiSO_2$). BattMan findings were presented to the Joint Defense Manufacturing Technology Panel and the Office of the Deputy Under Secretary of Defense for Advanced Systems and Concepts. Further review of the operational situation revealed problems across the three battery producers, with steep production increases to meet a sharp increase in demand levels and with the reverse effect following a sharp decline in demand. The Operation Iraqi Freedom battery situation received the interest of the President of the United States.

DoD—in conjunction with DLA, the U.S Army, and the Missile Defense Agency (MDA)—initiated the LBI to deal with sharp fluctuations in battery demand. Managed by DLA, the LBI was funded by the Office of the Deputy Under Secretary of Defense for Advanced Systems and Concepts and MDA.

The LBI consisted of two phases. Phase I, which began in January 2005, included LBI team visits to each of the C-E battery producers in January and February 2005 to solicit their participation in the initiative. After obtaining their agreement to participate, the LBI team assessed each producer's LEAN progress and established baselines for key performance measures. The team conducted and documented enterprise-level current and future state value-stream maps and capacity analysis for the battery system at each participating producer. This analysis helped identify and assess manufacturing process capability and scalability issues for both the producer and its supply chains. It also provided insight on the major value-stream producibility, affordability, and availability drivers, including key supplier constraints. Opportunities in line with desired demand rates for each producer were identified, quantified, and prioritized, and action plans were developed. An evaluation matrix was generated for each producer to assist with prioritizing the projects identified in the action plans. In addition, the team developed implementation plans for each producer, which are continuously updated. Phase I was completed in April 2005.

Phase II began in June 2005 and is scheduled to take approximately 12 months. Its focus is on the execution of the action plans developed for each producer and on the implementation of key improvements identified during Phase I. During Phase II, key supply chain constraints are being monitored to identify common producer issues. Improvement workshops, or Kaizen events, are being held to focus on company improvements that will result in the highest return for demand gains and sustainment. These efforts will help ensure the most efficient operation at each company, maximizing the capacity of available equipment, processes, and workforce to allow for the lowest possible pricing. LEAN was also used to identify the optimum investment plan to achieve greater production with minimum investment. LBI's success requires true partnering with the industrial base.

Specifications: The First Step in "Going Purple"

For well over 20 years, rechargeable and throwaway military batteries for man-portable applications have been defined by military specifications, either detailed or performance based. These specifications defined the physical envelope of the particular battery and the temperature range and electrical conditions over which the battery must operate. The specifications emphasized safety in use for the service members and quality and consistency of products delivered by the manufacturer. Safety and quality are still critical elements of the specifications, which have evolved to incorporate new technologies and lessons learned. The lessons learned include the need for greater capacity or longer battery life, increased interoperability, and the need to tell the user how much energy remains in the battery, commonly known as the "state of charge."

During FY05, the specification for high-performance nonrechargeable lithium batteries, MIL-PRF-49471, went through a rather radical transformation. The specification restructuring reflects a joint perspective and will, for the first time, institute a qualification program for the batteries. The change is scheduled to be completed near the end of FY06. DLA anticipates awarding contracts resulting from sources listed on a qualified products list in FY07. The joint nature of the specification is most readily apparent with the inclusion of Navy safety testing in accordance with the Navy S9310 standard. Previously, the Navy's safety concerns were addressed separately from the Army's performance requirements. With the revision, both battery performance and safety assessments for Navy and Marine Corps use will be addressed under a single document and qualification program. This also reflects a long-standing, but growing, level of cooperation between the Army's C-E LCMC and Naval Surface Warfare Center elements located at Crane, IN, and Carderock, MD. Similar changes are anticipated for MIL-PRF-32052, the main specification for rechargeable batteries.

The Bottom Line: Teaming for the Warfighter

The DLA and C-E LCMC team is committed to providing the best C-E power source possible and ensuring that power is available for the nation's warfighters when needed.

About the Authors

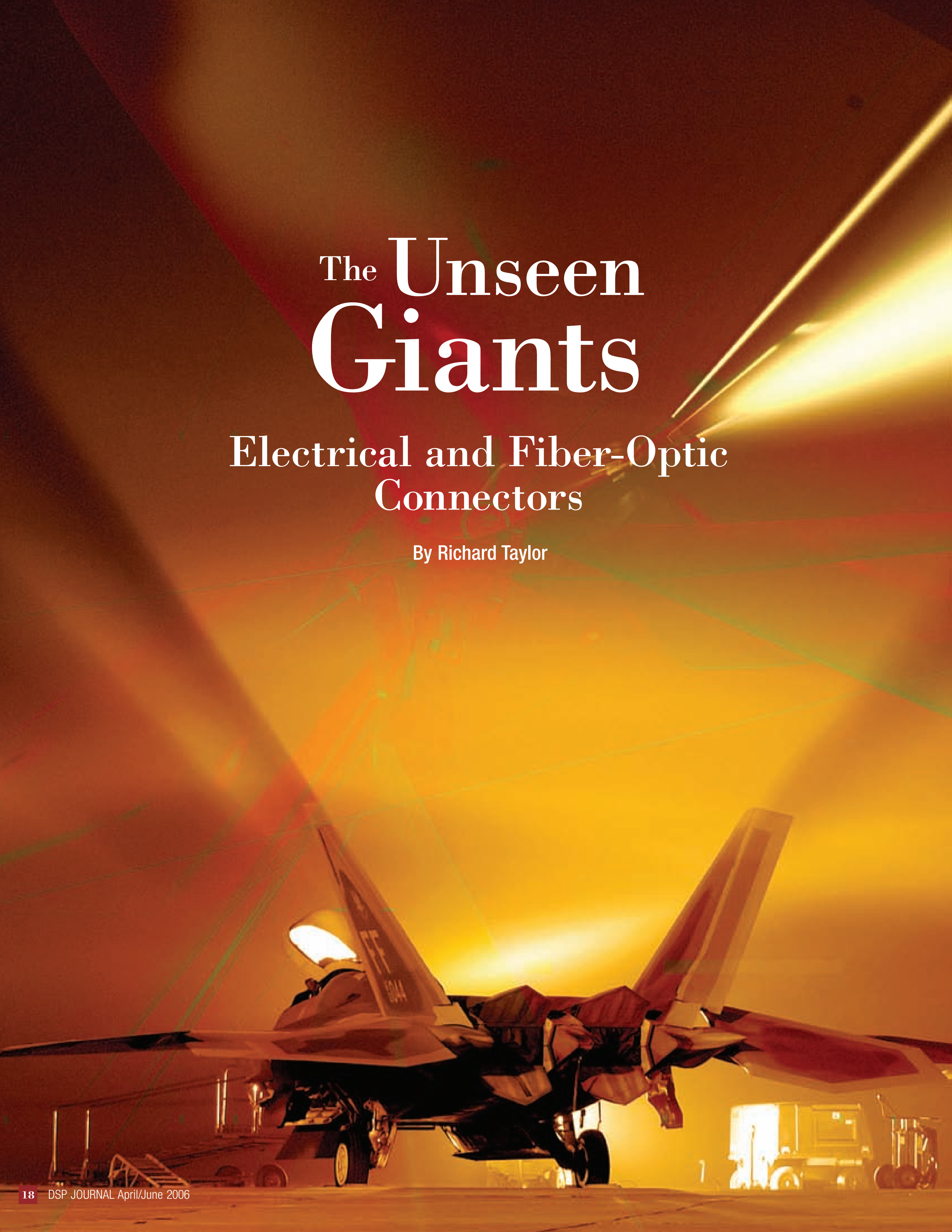
Ron Cialino is a supervisory electronics engineer and chief of the Power Sources Branch, Communications-Electronics Life Cycle Management Command, Logistics and Readiness Center. A member of the Army Acquisition Corps, Mr. Cialino is Level III certified in systems planning, research, development and engineering, production, quality, and manufacturing.

John Thompson is the program manager for the Next Generation Manufacturing Technology Initiative, Power Sources and Special Projects, Defense Supply Center Richmond. He also chairs the DoD Power Sources Technology Working Group and the Joint Standards Board for Power Source Systems. In addition, he leads the LEAN Battery Initiative for the Joint Defense Manufacturing Technology Panel and represents DLA on the panel's Electronics Subpanel.

The Unseen Giants

Electrical and Fiber-Optic Connectors

By Richard Taylor



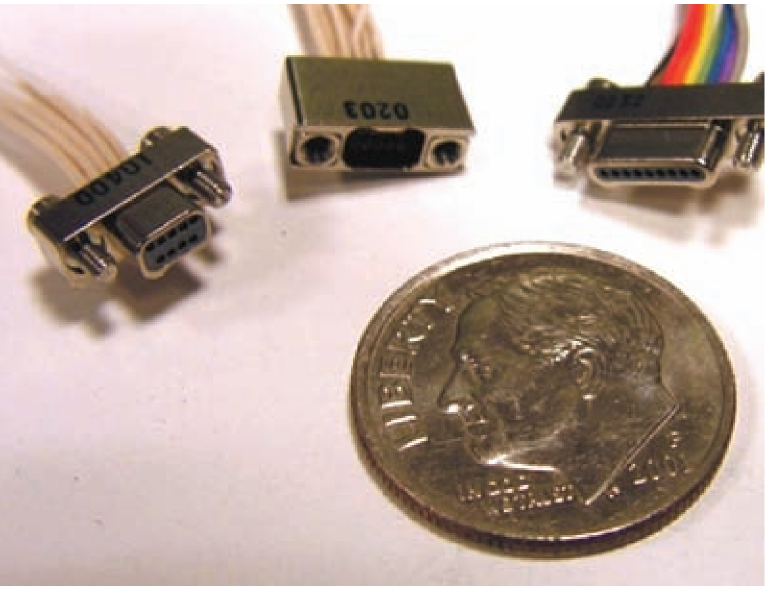
Sophisticated weapon systems make the warfighter of today more lethal than ever before. Billions of dollars are spent on research to develop new technologies that go into these sophisticated weapon systems. Brilliant minds develop implementing strategies and design circuits. Then all of this amazing technology is joined together to form a system. Have you ever wondered how all of this is brought together? It's through connectors. It's hard to imagine a world without these unseen giants. Every appliance in your home receives its operating power through a connector. Your television and sound systems receive their signal and are interconnected through connectors of some kind. Light bulbs screw into a connector and yet the connector is seldom thought of until the last phases of system development. Those who live in the connector world understand all of this and have come to accept their invisible status with pride. Those in the connector world also know that, because of their status, they must anticipate the needs of emerging technologies.

The Defense Supply Center Columbus (DSCC) Document Standardization Unit, with its Interconnection Devices and Electronic Components teams, works to ensure that weapon system designers have available standardized, well-documented, high-reliability connectors for use in new weapon systems. To this end, a number of initiatives are in various stages of development at DSCC.

Nano and Ultra-High-Density Electrical Connectors

A new electrical connector specification for "nano" connectors—MIL-DTL-32139—was issued on July 21, 2004. These connectors are intended for use on printed circuit boards, connecting cables to wiring boards or panels, or cable-to-cable applications on miniaturized equipment. Each of these devices feature nine insert arrangements of 7 to 51 contacts, with contact spacing of 0.025 inches. These connectors come in one-row and two-row versions. For the single-row version, the connector length varies from 0.5 inches (9 pin) to 1.55 inches (51 pin), with a width of 0.115 inches. For the dual-row connectors, the length varies from 0.375 inches (9 pin) to 0.9 inches (51 pin) with a width of 0.125 inches. For the dual-row version, spacing between cavity centers is 0.04 inches, and the largest size wire that can be used is 30 AWG (American Wire Gauge). With a current rating of up to 1 ampere per contact, these connectors are useful for a wide range of signal and control applications. They are the smallest and lightest standard military electrical connectors.

Under development is a general specification for ultra-high-density electrical connectors, along with eight specification sheets with detailed device specifications. These connectors come in 192-, 196-, 372-, and 396-pin configurations, with 0.05-inch spacing between contacts. The first two are approximate 2.9 inches long by 0.6 inches wide, and the latter two are approximately 5.5 inches long by 0.6 inches wide.



Already deployed in existing systems (for example, the F-22 and F-35), with their obvious advantages, the use of these new connectors is expected to continue to grow wherever weight and space constraints are an important factor in system design. This is especially true with aircraft, missile, and space applications.

Fiber-Optic Connectors

As systems become lighter and smaller, requiring nano and ultra-high-density connectors, they are also becoming faster. In some situations, they are so fast that magnetic fields generated by flowing electric currents impede the flow of information. These magnetic fields are the same magnetic fields that make electromagnets work and cause electric motors to turn. The magnetic fields have a restrictive effect on the flow of the information and also radiate outward as if from a transmitting antenna. These two properties serve as a limitation on the transmission of high-speed data. One very effective approach to avoid these limitations is to use a different transmission medium. Specifically, light, rather than electrons, can be used to carry the information. The technology that uses light to carry information is collectively referred to as "fiber optics." Information is imprinted on a series of light pulses and is transmitted along a fine fiber of glass. The flow of light down the fiber of glass does not generate the magnetic field as does the flow of electric current. Fiber optics has two advantages: speed is not limited by a magnetic field, and information is not radiated outward. The outward radiation can interfere with other nearby signals and be detected by hostile forces. The effective implementation of this technology is also dependent on connectors.

In support of such weapon systems as the Patriot Missile Defense System, National Missile Defense Shield, and Warfighter Information Network, DSCC is working with industry and the services to develop a ruggedized hermaphroditic (neither pin nor socket) tactical fiber-optic cable assembly. This connector is being documented primarily for the Army under the existing MIL-C-83526 family of fiber-optic connectors; this specification is being converted to a performance-based document.

Working closely with the Naval Sea Warfare Command at Dahlgren, VA, manufacturers, and the user community, DSCC is developing documentation for a new standardized fiber-optic connector primarily for shipboard and airborne applications. Dubbed the Next Generation Fiber-Optic Connector, or NGCon,

the connector has a future for use in a broad spectrum of applications. The NGCon will make available to designers a lightweight standard multi-terminus fiber-optic connector. Termini in fiber optics equate to contacts in electrical connectors.

In December 2004, DSCC also developed two tight tolerance fiber-optic specification sheets under the existing MIL-DTL-38999 connector family. Tighter tolerances were introduced to address the alignment sensitivity of fiber-optic termini. MIL-DTL-38999/60 and 38999/61 are fiber-optic versions of extensively used high-density electrical connectors. These specification sheets give designers the fiber-optic option in a connector that they have a great deal of experience with and confidence in, based on past performance. Field users will recognize the new connectors and be familiar with their maintenance and operation.

Qualification of Connectors

To meet the needs of today's weapon systems, the performance and environmental requirements of the electrical and fiber-optic connectors are both stringent and complex. To verify that components are capable of meeting these requirements, extensive testing is required. Some tests take hundred of hours to complete and require specialized equipment. To complete this verification testing each time connectors are ordered would add cost and excessive time to the delivery schedule.

To prevent a quality assurance time lag, advance testing, "qualification" is done prior to any acquisition of these connectors. DSCC administers a qualification program for these connectors, as well as for many other types of standard components. DSCC verifies that the design of a component meets the requirements of a specification during initial qualification and continues to ensure compliance and manufacturing process consistency during periodic inspections.

The qualification program administered by DSCC significantly shortens the delivery time for connectors and maintains the confidence level of the system designer. Original equipment manufacturers (OEMs) know that qualified connectors consistently meet the requirements of the specifications. The impartial auditing staff administering the qualification program at DSCC relieves connector manufacturers of the burden of meeting repeated testing requirements frequently imposed by OEMs.

DSCC works in the world of electronic and fiber-optic connectors that are invisible to many, but are key building blocks for successful system integration, forging the way for emerging technologies that make our warfighters the most formidable fighting force in history. As new systems move from concept development to production and deployment, DSCC, and the connector specifications it writes, will be silently clearing the path with enabling connector technologies.

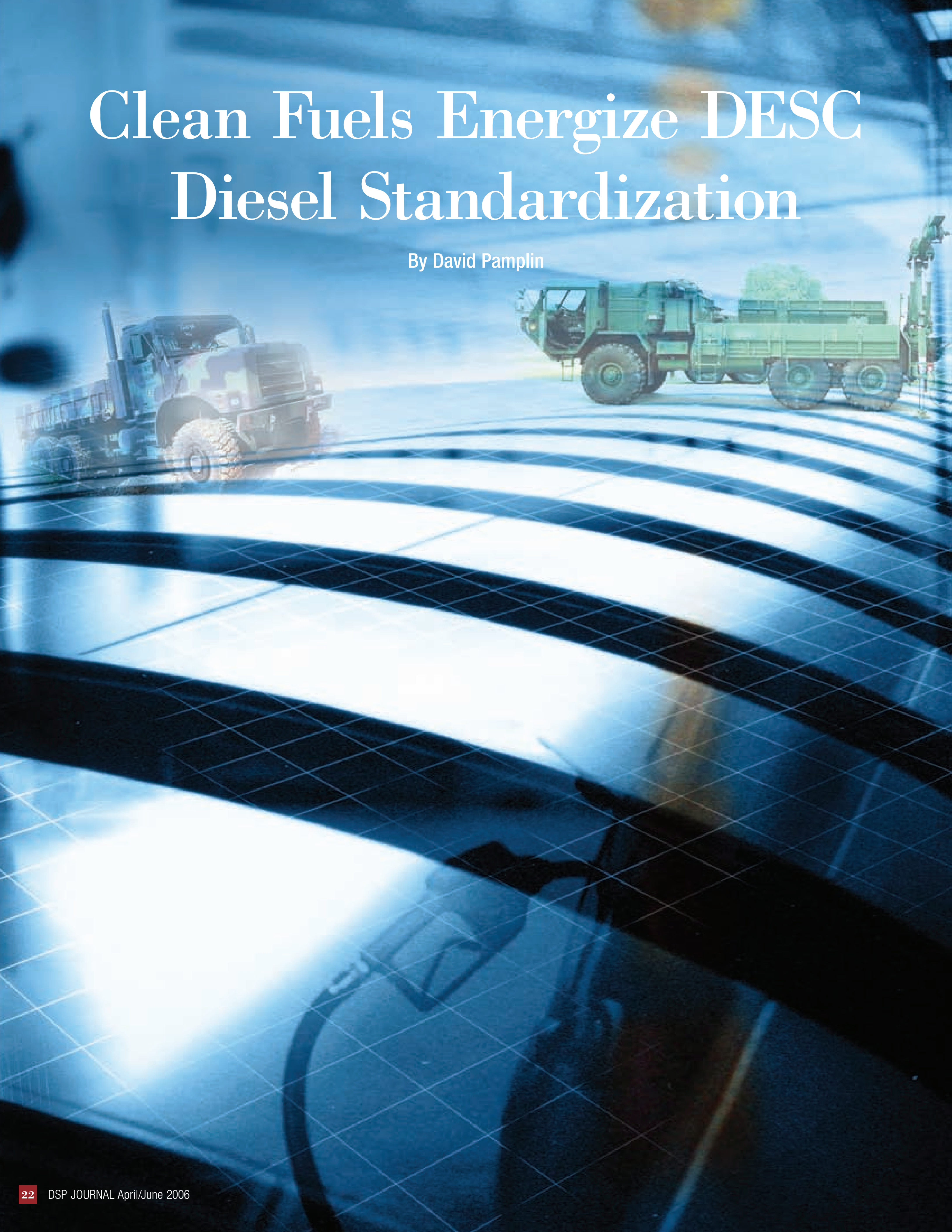
The author wishes to thank those in the Document Standardization Unit and the Sourcing and Qualification Unit who provided input to this article.

About the Author

Richard Taylor is the chief of the Interconnection Devices Team in the Document Standardization Unit at the Defense Supply Center Columbus. He has been in government service for nearly 34 years. For the last 20 years, he has been writing and maintaining military specifications at the Defense Logistics Agency. Previously, he spent 13 years with the Michigan Department of Military Affairs as an aircraft mechanic and avionics repairman.

Clean Fuels Energize DESC Diesel Standardization

By David Pamplin



What does an Army specialist at Fort Carson, CO, have in common with a career chemist at the Defense Energy Support Center (DESC), two former directors of the Army Petroleum Center, an Air Force major, and an Air Force colonel? All six were instrumental in bringing about the conversion of hundreds of Army and Air Force installations nationwide from the use of a government specification for automotive diesel fuel to the use of a non-government standard: American Society of Testing and Materials (ASTM) D975, "Standard Specification for Diesel Fuel Oils."

A Success Story

The cost-saving conversion to a non-government standard for automotive diesel might never have happened in the course of "business as usual." But it did happen, thanks to a series of actions that culminated in unanimous customer endorsement of standard commercial diesel.

The first action—in February 2000—occurred at a half-day presentation by a DESC chemist at the Army Petroleum Center in New Cumberland, PA. That chemist, recognizing that solids contamination has no place to hide in today's relatively clear diesel fuels, proposed to the Army that the dark, high-sulfur fuels produced by refiners in the past should no longer control the design of our fuel specifications. DESC recommended that the use of standard commercial diesel conforming to ASTM D975 be tested in a limited geographic area.

In June 2001, Army and Army National Guard units in the Midwestern United States began using the same, less expensive grade of diesel that was being used by nearby Navy and U.S. Postal Service facilities. Six months into this 3-year test program, a DESC representative met with a specialist at Fort Carson's 59th Quartermaster Company to check a sample of the ASTM D975 automotive diesel fuel supplied by DESC's contract supplier. The diesel fuel had a bright yellow tint, but it was also clear and bright. For fuels, "clear and bright" has a technical connotation indicating that the product satisfies one key performance criterion—it is transparent, not opaque. It was an auspicious beginning for a DESC customer relationship management effort that would span more than 4 years.

Twelve months later, a DESC representative visited the G4 Directorate at Fort Riley, KS. That visit revealed an interesting base fuels operational structure, one in which the diesel fuel provided by DESC's supply contractor was actually received, stored, and distributed by a service contractor. Again, a sample taken from the fuel farm revealed that the fuel was clear and bright. Because the fuel satisfied this key requirement, it could not conceal sand or rust particles, and, in fact, no solids could be seen when the fuel was placed in a clear glass jar. The only thing that was obvious was that this fuel had a greenish-yellow tint.

Citing the satisfactory performance of ASTM D975 diesel fuel at Fort Carson and Fort Riley, DESC's deputy director for operations recommended to the Army Petroleum Center that all Army and Army National Guard installations in the continental United States be converted from federal specification diesel to ASTM D975 product. He also noted that after a year of operation on commercial product, Fort Carson not only had no complaints, but was also accumulating savings at the rate of $10,000 per year. Fort Riley's more extensive operation was accumulating savings at a rate of $50,000 per year.

Encouraged by the Army's satisfaction with use of a non-government standard for this key fuel, DESC promoted the use of ASTM D975 product in a new venue: Wright-Patterson Air Force Base, OH. In September 2003, DESC briefed civilian and military personnel assigned to the Air Force Petroleum Office. DESC's audience included one civilian chemist who had previously worked with the standard commercial diesel initiative while assigned to the Army's Tank-automotive Armaments Command—a fortunate coincidence. Within a month, a military point of contact within the Air Force Petroleum Office was assigned to oversee an Air Force test program patterned after the Army program. Again, installations in the Midwest were selected for inclusion in the first round of standard commercial diesel use.

As the Army's 3-year test program drew to a close, and with DESC's recommendation for expanded use of commercial diesel in mind, the director of the Army Petroleum Center approved a limited expansion of the Army test program to five Western states. He noted that the Midwestern test program had demonstrated standard commercial diesel's achievement of quality requirements, with no adverse impacts on operability. A subsequent director was similarly impressed with the results and dollar savings associated with this standardization initiative. Noting that more than 200 samples of ASTM D975 standard commercial diesel fuel collected at base level satisfied quality requirements, he concluded that further expansion of the Army's use of commercial fuel would save an additional $400,000 per year.

By October 2005, about 4½ years after the test program began, Army facilities using commercial automotive diesel fuel stretched from coast to coast. At that point, the Army had accumulated $2.5 million in savings, and no installation had asked to be converted back to federal specification product.

The Air Force is likely to realize similar savings; in just 1 year, it had saved $459,000 in its Midwestern test area, and it had detected no quality deficiencies. In November 2005, the Air Force Petroleum Office asked DESC to convert all remaining Air Force installations in the continental United States to commercial product. Although the Army got a head start, the Air Force is catching up quickly, and already uses standard commercial diesel in 23 states.

February 2006 marked the start of performance of more than a dozen new DESC contracts for standard commercial automotive diesel fuel. Army and Air Force activities in New England are now receiving the same grades of automotive diesel that DESC supplies to Navy and federal civilian facilities in the area.

A chapter of history in which DESC supplied federal specification automotive diesel to its Army and Air Force customers and non-government specification commercial diesel to the Navy and federal civil agencies is drawing to a close. Dark-colored, high-sulfur diesel fuels that could conceal significant amounts of solids contamination are a thing of the past. DESC's purchase specifications now reflect this fact. Standardization has claimed a victory on the most favorable terms!

Building on Success

DESC is pursuing initiatives to purchase other grades of diesel fuel to non-government specifications. These other product grades include marine diesel, ultra-low sulfur diesel (ULSD), and biodiesel.

MARINE DIESEL

In June 2005, DESC moved beyond use of a purchase description to define marine diesel product performance requirements and solicited marine fuel in commercial ports that conforms to ASTM D6985, "Standard Specification for Middle Distillate Fuel Oil–Military Marine Applications." Use of this non-government standard in domestic bunker fuel solicitation SPO600-05-R-0114 represented a milestone for DESC. DESC contracting personnel solicited vendor proposals for supply of a total of 117,644,650 gallons of long-term distillate ship's fuel in more than 120 ports over a 2-year period. Several of these ports were in the state of California. Consensus specification ASTM D6985, first published in 2004, moves the expectation of fuel composition from the worst-case sulfur content scenario defined by ISO 8217 to a 1.0 percent maximum (0.50 percent maximum where required by law). These more restrictive sulfur content limits better advertise the actual composition of commercial distillate ship fuels (marine gas oils) worldwide.

At an October 2005 meeting of commercial fuel suppliers, environmental regulators, and ship owners and operators, a representative of DESC's Product Technology and Standardization Division presented a detailed analysis of more than 1,000 fuel samples taken during commercial refueling evolutions. Considering this market research, DESC concluded that commercial ship fuel is better than advertised, when actual fuel performance is compared to the international specification for marine gas oil (ISO 8217). DESC noted that, based on a large sampling of actual refuelings, 84 percent of non-contract open market purchases of marine gas oil in U.S. ports satisfies the key requirements of ASTM D6985, including the sulfur content requirement. This conclusion was based on detailed laboratory analyses of 157 fuel samples. DESC further highlighted the even higher performance of fuel received by DESC's customers in commercial ports under long-term DESC contracts: 94 percent of the fuel samples received satisfied the key characteristics of ASTM D6985.

The California Environmental Protection Agency's Air Resources Board conducted a public meeting in December 2005 to discuss its plan to control the sulfur level of ship fuel for vessels operating within 24 miles of the state's coastline. The proposed California regulation will require reduction of ship exhaust emissions beginning in January 2007, with a primary conformance strategy being the use of 0.50 percent maximum sulfur content fuel. The proposed regulation referenced ISO 8217, but did not reference the newer ASTM D6985 specification.

DESC noted that, based on a large sampling of actual refuelings, 84 percent of non-contract open market purchases of marine gas oil in U.S. ports satisfies the key requirements of ASTM D6985, including the sulfur content requirement.

DESC provided written comments to the state of California, noting that the ASTM specification for ship fuel defines maximum sulfur content at exactly the level specified in the proposed California regulation. DESC recommended that the regulation reference both ISO 8217 and the ASTM specification. It also recommended that the regulation state "use of this (ASTM D6985) grade of marine fuel represents de facto compliance with the fuel sulfur standard that will apply during the period 2007–2009."

ULTRA-LOW SULFUR DIESEL

DESC will soon be purchasing ULSD for vehicles. Per direction from the U.S. Environmental Protection Agency, refiners must make available automotive diesel fuel with a maximum sulfur content of just 0.0015 percent sulfur (15 parts per million sulfur) beginning this summer. In preparation for that nationwide roll-out of extraordinarily clean-burning diesel fuel, DESC has established National Stock Number 9140-01-524-0139. One early customer for ULSD receives its product deliveries by marine barge. Almost 1 million gallons of ULSD have been successfully delivered to San Clemente Island, CA, by DESC contractors over the past 12 months. ULSD will satisfy the requirements of model year 2007 heavy-duty trucks and, coincidentally, satisfies additional environmental requirements established by California's South Coast Air Quality Management District (San Clemente Island falls within that district). DESC purchases ULSD to the same non-government standard (ASTM D975) that is used to support standard commercial diesel buys.

BIODIESEL

Federal military and civil activities continue to rely heavily on DESC to supply them with alternative fuels in order to meet requirements to reduce the usage of conventional petroleum fuels in their vehicle fleets. The Energy Policy Act of 1992 and Executive Order 13149 (2000) require government fleets of over 20 vehicles in certain areas of the country to acquire alternative-fuel-capable vehicles, use alternative fuels in such vehicles a majority of the time, and reduce the overall usage of petroleum fuels by 50 percent over 1999 baselines. One alternative fuel technology that government activities have been able to embrace to readily adhere to those requirements is "B20."

B20 is a blend of 80 percent conventional diesel fuel and 20 percent pure biodiesel, a fuel blend stock derived from either a vegetable oil or animal fat source (soybeans are the primary sources in the United States). B20 is unique in that, unlike other alternative fuels, it can be used in conventional vehicle engines without modifications. The Department of Energy grants credit to activities that use B20; that credit is equivalent to the actual acquisition of one light-duty-type alternative vehicle for every 2,250 gallons used. B20 is used by the vast majority of military and civil activities to meet alternative fuel requirements; in FY05, DESC contracts supplied nearly 11 million gallons of the fuel to military activities, over twice the amount supplied during FY04.

DESC has contributed extensively to ASTM's effort to devise a non-government standard for B20 biodiesel blends. In the interim, DESC purchases biodiesel for its customers to a federal specification. However, DESC continues to invest in efforts to finalize a commercial specification for biodiesel so that all U.S. direct delivery diesel fuel buys will eventually be supported by non-government standards.

About the Author

David Pamplin is acting chief of the Product Technology and Standardization Division at the Defense Energy Support Center. For more than a decade, he has participated in the preparation of NATO standardization agreements that define fuels. Mr. Pamplin served as site chief for DESC's Kaiserslautern Area Petroleum lab in Germany from 1996 to 1999 and, in that capacity, was responsible for testing fuel destined for Air Force One. Prior to his government service, he worked in the refining industry for 6 years.

Developing a New Specification for Microprocessors Used in the AN/ALE-47 Electronics Countermeasures Dispensing System

By Charles Saffle

The Electronics Countermeasures Dispensing System—AN/ALE-47—is vital to aircrew survivability in hostile environments. Used on numerous Army, Navy, Air Force, and Marine Corps aircraft, the AN/ALE-47 is a "smart" system, allowing the aircrew to optimize the countermeasures employed against antiaircraft threats. The system is more automated and programmable than its predecessor (ALE-40), providing enhanced capabilities to better support the aircraft mission. The AN/ALE-47 can dispense a mix of expendable countermeasures, including jammers and conventional chaff and flare decoys, as well as the new generation of "active" decoys. The AN/ALE-47 can also be used to dispense the new family of intelligence sensors and monitoring devices.

The operation of the AN/ALE-47 is dependent on "ruggedized" microprocessors that are capable of surviving demanding operational environments and that comply with MIL-STD-1750A, "Military Standard Sixteen-Bit Computer Instruction Set Architecture." The MIL-STD-1750A microprocessor is a single-chip 16-bit microprocessor that implements the MIL-STD-1750A instruction set architecture. The processor executes all of the MIL-STD-1750A instructions, including floating point operations. In addition, it supports interrupts, fault handling, memory expansion, and input/output operations, as well as the optional instructions related to those operations.

Until early 2000, the need for an AN/ALE-47 system microprocessor was satisfied with Standard Microcircuit Drawing (SMD) 5962-89519 under the defense performance specification for microcircuits—MIL-PRF-38535, "Integrated Circuits (Microcircuits) Manufacturing, General Specification for FSC 5962"—and its associated qualified manufacturers list (QML).

The problem? In March 2000, the last supplier of SMD 5962-89519 microprocessors dropped off the QML. The only stock available to the military services was what was left at the depots.

The Solution

In November 2004, the ALE-40/47 program manager at Warner Robins Air Logistics Center, GA, contacted the Defense Supply Center Columbus (DSCC) Active Devices Team regarding an urgent need to obtain a new supplier for the 1750-compliant microprocessor. This microprocessor was needed to meet the requirements of the Air Force and the Navy, which were in production on the AN/ALE-47. Meeting the need for a 1750-compliant microprocessor required finding a manufacturer with the technological ability to produce a highly complex device that can withstand the demanding requirements of MIL-PRF-38535,

About SMDs

An SMD depicts the government's requirements for a standard high-reliability microcircuit, tested for a military application. An SMD specifies the configuration, envelope dimensions, mounting and mating dimensions, interface dimensional characteristics, performance requirements, and inspection and acceptance test requirements as appropriate for a military environment.

Today, SMDs are widely used throughout the defense community and remain the most efficient, cost-effective vehicle for procuring and supporting high-reliability microcircuits for military applications.

SMDs are available on the DSCC website at http://www.dscc.dla.mil/Programs/MilSpec/DocSearch.asp.

incorporates the necessary programming algorithms, and can be a drop-in replacement in the AN/ALE-47 (to avoid a costly and time-prohibitive redesign of the system).

DSCC engineers contacted two microprocessor manufacturers with the potential to produce the 1750-compliant microprocessors, hoping that one of them could become a QML supplier of these devices. After working with both potential manufacturers and evaluating their proposals, DSCC eliminated one of them because its proposed solution required a system board redesign for this application. DSCC engineers continued to work closely with the other manufacturer, Honeywell, on its attempt to produce the military-compliant 1750 device.

An intensive effort by DSCC engineers, engineers at Honeywell, and the Air Force program office resulted in the determination that the Honeywell device could function in the system as required. However, the new microprocessor did not meet the specification requirements as detailed in SMD 5962-89519. DSCC engineers quickly worked with Honeywell to identify the needed engineering requirements and developed a new SMD—SMD 5962-05207, "Microcircuit, Digital, CMOS, 16-Bit Microprocessor, MIL-STD-1750 Instruction Set Architecture, Monolithic Silicon"—that technically describes the new device that could be qualified to the MIL-PRF-38535 requirements.

DSCC engineers, the SMD preparing activity, worked with the qualifying activity, supplier, and the original equipment manufacturer (OEM) (Symetrics Industries) to qualify this new device. The ALE-40/47 Integrated Product Team Lead at the Naval Air Systems Command worked directly with Honeywell to qualify the new device in the AN/ALE-47. SMD 5962-05207 was released for use on February 18, 2005.

Standardization Success through Teamwork

The biggest constraint on this project was the need to complete an intensive standardization effort that involved DSCC, microprocessor suppliers, the Air Force, and the Navy, all within a very short time frame. The need for speed was further driven by a directive, issued on February 10, 2005, by the U.S. Air Force Central Command, that no aircraft may enter the Middle East without countermeasure protection.

The 3-month effort to meet the need for a new 1750-compliant microprocessor could not have been accomplished without cooperation among supplier, military departments, OEMs, and DSCC. Standardization activities included the preparation and coordination of the new SMD and qualification and test samples; in addition, a system test had to be conducted using this product in the end item. The ALE-40/47 program manager stated that "this system is a directed Joint Service Program with the [Air Force] as the lead service. To date there are approximately 3000 fielded systems with projections at 5000."

All of the individuals involved in this effort understood the importance and impact of getting this device qualified and listed as an SMD device from a QML manufacturer. The rapid completion of the new SMD (5962-05207) was made possible through continuous communication and coordination of efforts among the many DSCC, Honeywell, and ALE-47 program office and systems personnel.

The microprocessor covered by this new SMD is used in all types of aircraft (fighters, airlift, and helicopters) in Operation Enduring Freedom, Operation Iraqi Freedom, and Operation Joint Force. A $25 million contract for the procurement of the Electronics Countermeasures Dispensing System was allowed to proceed without the need for a costly redesign of the system. This not only saved the government millions of dollars—redesign would have conservatively cost $10 million—but allowed aircraft entering the Middle East to have the protection necessary to protect our warfighters. Thus, the true savings cannot be measured in dollars and cents, but in the lives the deployment of this countermeasure system may save.

About the Author

Charles Saffle is an electronics engineer on the Active Devices Team at Defense Supply Center Columbus. He has held engineering positions on various weapon systems and programs within the Air Force and the Defense Logistics Agency during his 18-year career. Prior to his federal service, Mr. Saffle spent 3 years as an electronics engineer with a military avionics manufacturer.

The SMD Program

The purpose of the SMD program is to prevent the proliferation of contractor-developed drawings describing generic microcircuits as if they were program-unique devices. SMDs cover standard off-the-shelf high-reliability microcircuits targeted for military applications, using only one standardized document. The SMD program increases the manufacturing base for DoD procurement and provides substantial savings in both acquisition and logistics.

The SMD program began in response to a number of military system failures that underscored the inability of OEM-prepared drawings to provide reliably tested and standardized microcircuits. As a result, the OEMs requested that DoD implement a rapid-response single drawing program. The OEMs, device manufacturers, military services, and DoD representatives formed a planning and implementation team to address this issue. On the recommendation of the team, the Secretary of Defense announced an October 1, 1986, implementation date for an SMD program for microcircuits, based on a drawing program implemented by the Defense Electronics Supply Center. In early 1987, the Assistant Secretary of Defense for Production Support directed the military services and DoD agencies to implement all the necessary changes to contractual requirements by October 1, 1987.

A Tool for Improving Readiness through O-Ring Standardization and Item Reduction

By Cliff Wolfe, Michelle Kordell, Mark Perry, and Bob Pokorny

An O-ring—a doughnut-shaped part made out of a rubber elastomer material—is a simple device that is a critical component in everything from sink faucets to jet engines. DoD stocks more than 22 million O-rings and manages 43,000 different national stock numbers (NSNs). Despite the commodity-like nature of these parts, the DoD O-ring inventory is troubled by material obsolescence, limited shelf life, holding cost, and unreasonable lead-times. This situation is exacerbated by the conspicuous lack of accuracy and completeness in O-ring descriptions from DoD legacy data systems. As a result, engineers find it difficult to identify candidates in the NSN population of O-rings for substitution or item reduction—and ultimately, for standardization. The elastomer used to manufacture an O-ring is probably the most critical defining characteristic in determining its potential for substitution in a particular application. This is also the property that is most often poorly described in DoD legacy data.

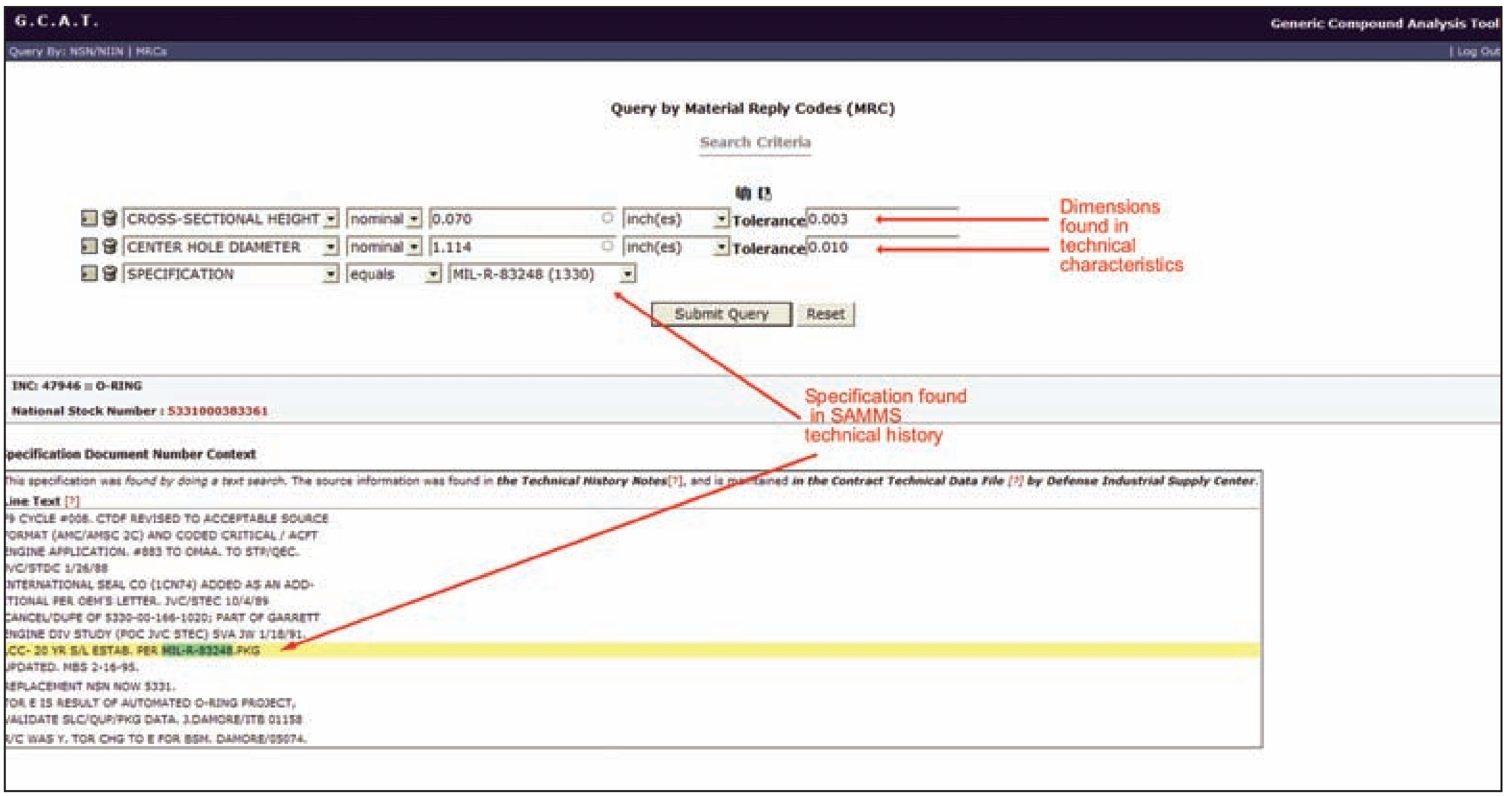
Concerned about O-ring proliferation and its potential negative impact on DoD customers, the Defense Logistics Agency (DLA) Weapon System Sustainment Program (WSSP) instituted a research and development (R&D) effort to better understand and standardize data about elastomers.[1] The initial thrust of this effort—which involved engineers from LMI, XSB, Inc., and Battelle—was to develop a knowledge base and user interface, or tool, that would enable DoD engineers to explore opportunities for standardization and item reduction by identifying elastomer materials and other common features of O-rings.

The tool developed to support decisions about substitution, item reduction, and standardization of O-rings is called the Generic Compound Analysis Tool (GCAT). GCAT uses advanced data mining technology to extract attributes from disparate public and military data sources, including legacy databases and documents, original equipment manufacturer (OEM) websites and product data sheets, and military and non-government specifications and standards.

GCAT will provide DoD opportunities for

- increasing interoperability,
- improving logistics readiness, and
- reducing total ownership cost.

Let's look at a typical O-ring, NSN 5331-00-038-3361, to explore some of the features in GCAT. The following illustration taken from the GCAT website shows some of the properties for this NSN:



GCAT retrieves the dimensions of this O-ring from the Federal Logistics Information System (FLIS) technical characteristics. But it is also able to isolate a reference to specification MIL-R-83248 (1330) from the free text of the Technical History Notes in the DLA Standard Automated Materiel Management System (SAMMS) Contractor Technical Data File.

However, just identifying the specification alone is not sufficient. GCAT is able to recognize this specification and infer the material "fluorocarbon rubber" from the specification title, as illustrated below:

National Stock Number Specification Document Number	5331-00-038-3361 MIL-R-83248	O-ring RUBBER, FLUOROCARBON ELASTOMER, HIGH TEMPERATURE, FLUID, AND COMPRESSION SET RESISTANT (S/S BY SAE-AMS7276, SAE-AMS7279, SAE-AMS3216, AND SAE-AMS3218)

Prior to GCAT, mining details such as this was a difficult, manually intensive effort. A human reader could spend hours searching for the narrative text from which this information is gleaned, even for a small number of NSNs. Consequently, information about the critical material properties of O-ring NSNs is frequently incomplete.

The Technology Behind GCAT

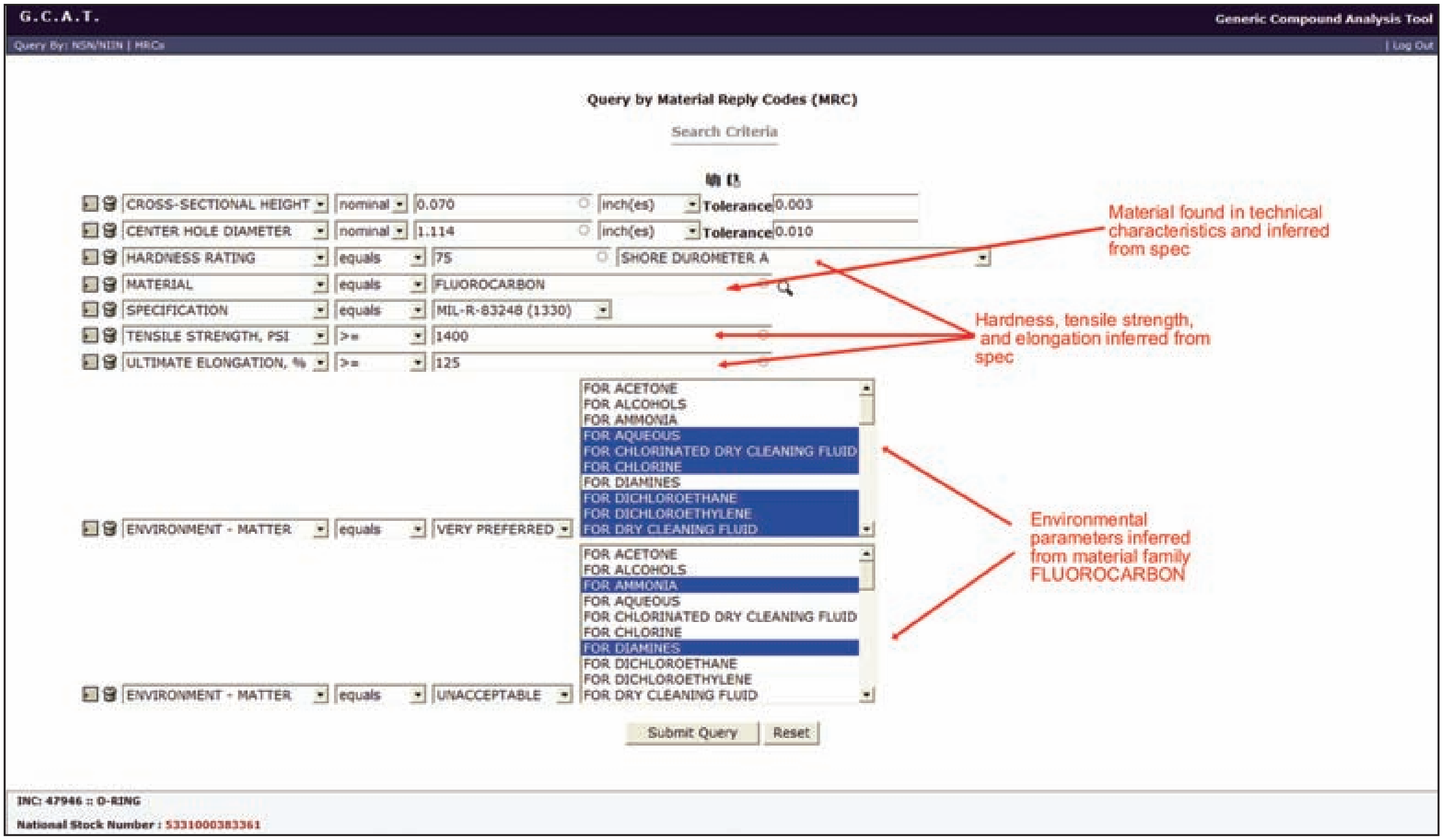
GCAT is based on advanced data mining technology. In 1999, the DLA logistics R&D program invested in the development of advanced software technologies for mining and reasoning about jargon-rich unstructured free text. The outcome of this investment was a text reasoning and extraction system based on XSB Tabled Logic Programming, a powerful open-source artificial intelligence technology originally developed with funding provided by the National Science Foundation.[2] This system was created by XSB, a small software company that develops custom applications using the core XSB technology. The Defense Standardization Program Office 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). GCAT makes extensive use of these techniques.

GCAT operates from a knowledge base of facts about O-rings. O-rings are made from elastomer compounds that are likely to have clearly defined properties based on industry specifications. However, different manufacturers tend to have different trade names for the same generic compound, and each manufacturer maintains internal specifications for the properties of that compound. To improve order fill rates—and, hence, readiness—it is desirable to know when an O-ring provided by one supplier is equivalent to that available from another supplier. To answer this question, GCAT examines data from three sources:

- DoD legacy data such as FLIS technical characteristics and the SAMMS Contractor Technical Data File

- OEM web data
- Military and non-government specifications and standards.

Continuing the example of NSN 5331-00-038-3361, the following illustrates what is known from these three sources:



Polymer scientists from Battelle provided domain knowledge about compounds commonly used to manufacture O-rings and about the environment for which these compounds are suitable. The scientists collaborated with engineers from LMI and XSB to train GCAT to interpret specifications as well as part numbering schemes used by manufacturers of O-rings, such as Parker Hannifin Corporation. In the above example, once the specification MIL-R-83248 was associated to this NSN from FLIS reference number data, the material "fluorocarbon" was inferred. In addition, Battelle scientists provided the domain knowledge that allowed inference of hardness, tensile strength, and elongation from the specification. Finally, the domain experts from Battelle provided the environments for which fluorocarbon is suitable, which established the inference rules in GCAT to present the preferred and prohibited environments for this NSN.

In addition to the knowledge provided by the polymer scientists from Battelle, GCAT is also enhanced with knowledge available from the websites of OEM suppliers. Manufacturers such as Parker Hannifin incorporate important information in the patterns of their part numbers. In Parker Hannifin's case, the key to decoding this information is provided in documents available at http://www.parker.com.

The following shows how a Parker Hannifin part number can be decoded:

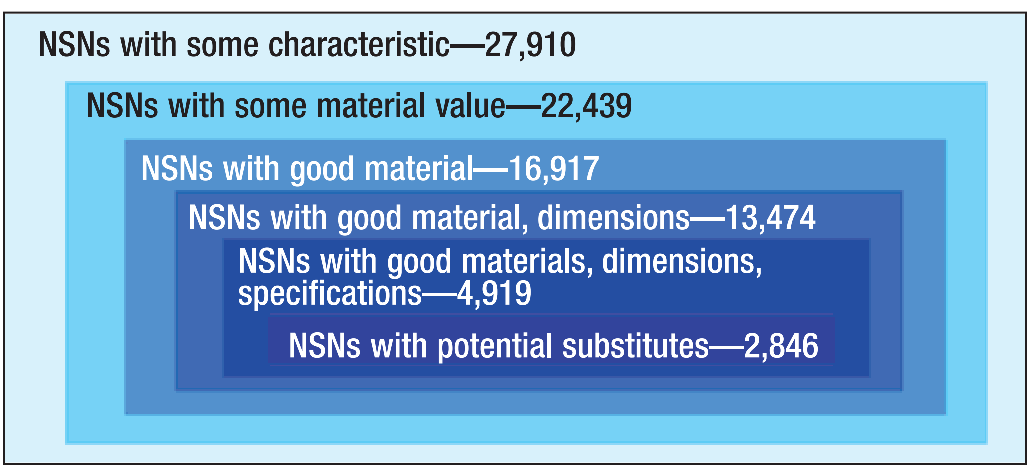
A Closer Look at the Advantages of GCAT

GCAT presents data about O-ring properties in a structured searchable website. This presentation not only reveals what is known about O-rings in DoD legacy data, but also provides OEM data and the embedded knowledge of polymer scientists. Both the accuracy and completeness of O-ring information are enhanced, and this enhanced information is available in an easily accessible tool.

As a preliminary example of what can be achieved with the current version of GCAT, the team looked at finding potential substitutes for an O-ring NSN based on a set of preliminary trial criteria. In this example, an NSN is considered a potential substitute for another target NSN if it meets the following criteria:

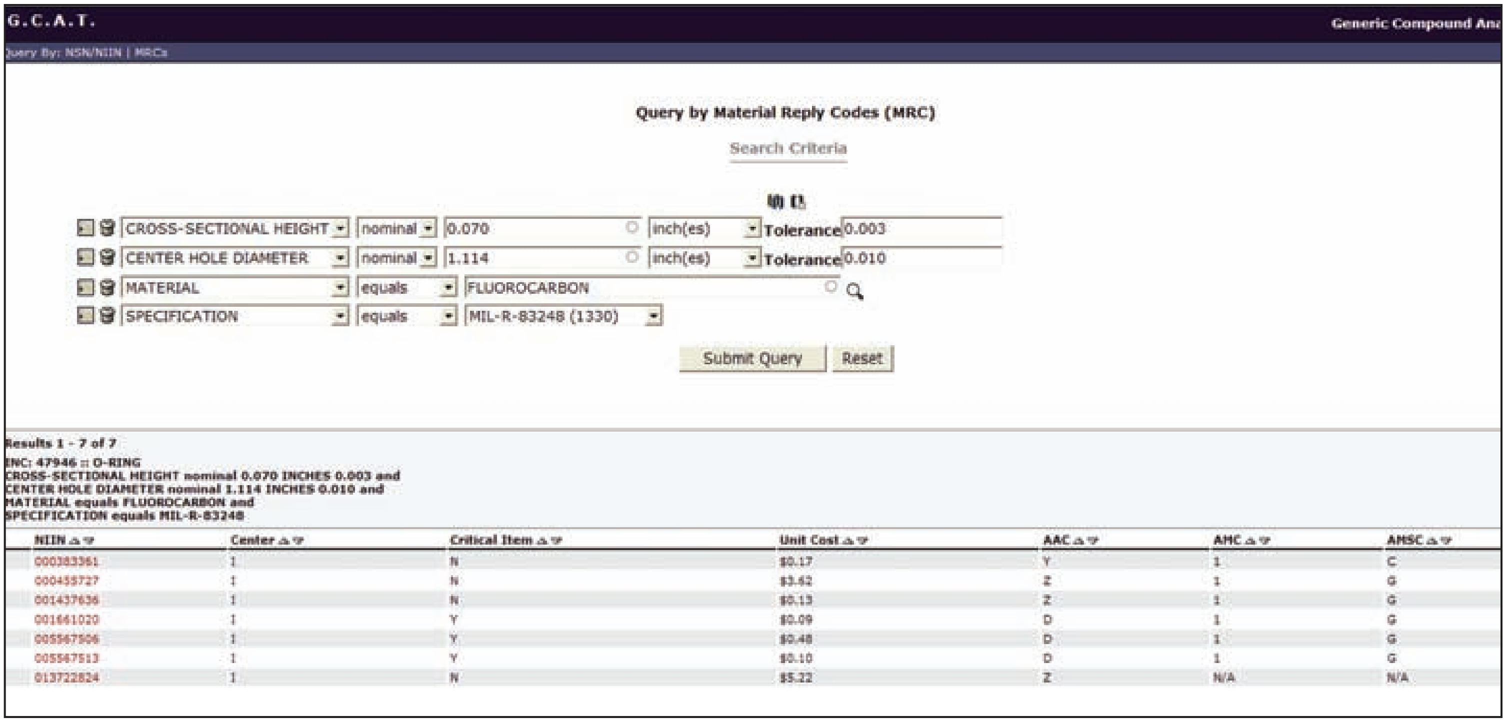
- Matches on the dimensions of cross-sectional thickness and center hole diameter
- Belongs to the same material family
- Meets the same specifications.

The following chart illustrates the number of potential substitutions that GCAT found based on these criteria:



GCAT has structured characteristic information on almost 28,000 O-ring NSNs. Of these, almost 5,000 NSNs had detailed information about material, dimensions, and specifications. Potential substitutes were found for almost 60 percent of these 5,000.

To conclude the example of NSN 5331-00-038-3361, in the following illustration, GCAT finds six substitutes for this NSN based on the above criteria:



Note: The "Critical Item" designation is assigned by DLA.

This examination of possible substitutes is presented to illustrate the power of assembling the properties of O-rings in a structured database derived from multiple data sources. It is not the purpose of GCAT to automate the processes of substitute selection or item reduction. Rather, GCAT is designed to put as much information as possible at the fingertips of the item managers, engineering support activity, and weapon system program managers who, together, must make the decisions about part substitution and item reduction. With GCAT, they can all access a common view of the DoD O-ring universe that is both more accurate and complete than the multitude of current legacy data sources.

Demonstration of Feasibility

The practicability of the GCAT-unique approach is being demonstrated in phases. Phase 1, May 2005 through March 2006, of this WSSP R&D project had the following features:

- *Used technology as an enabler.* The team accessed, decoded, and organized readily available, but heretofore unusable, data through the use of advanced data mining techniques. The team identified and analyzed part number logic available from OEM part numbers, as well as from commercial and military specifications, and it developed data extraction rules to generate structured O-ring properties. With this preliminary knowledge in hand, domain experts were able to review and extend the O-ring knowledge base and develop inference rules for material, temperature, and environment suitability.

- *Had a limited, manageable scope.* The team carefully limited the scope of knowledge included in the initial O-ring knowledge base. Data sources were limited to 7 military and 16 Society of Automotive Engineers (SAE) specifications and the product data sheets of two major OEMs—Parker Hannifin and Parco—who account for 30 percent of O-rings bought in FY04. The data from these product data sheets were included in GCAT for compounds in the nitrile material family, one of the most common O-ring elastomers. O-ring attributes were limited to dimensions (cross-sectional height and center hole diameter), temperature rating, hardness, environmental stability, material, specification, and environment suitability. In order to make use of the material knowledge, the team undertook a significant effort to generate a materials tree or taxonomy into which NSNs were placed. Starting with material types drawn from Federal Catalog System Master Requirements Codes, material experts added missing material families, expanded branches of the tree, and identified synonyms or material category redundancies. The team then assigned OEM compounds to the appropriate material category within the materials tree.
- *Involved a multidisciplinary team.* At the outset of the project, the team recognized the need to involve a diverse group of individuals in developing and reviewing technical and business rules to enable substitution and item reduction. The core development team includes the following types of experts:
  - Material scientists, who understand the critical physical attributes of O-rings, the relationships between standard specifications and industry trade names, the tolerance of values for physical attributes, and the impact of environment on O-ring selection
  - Data mining experts, who extract data from previously unusable sources, as well as organize and present data in formats that allow for review and extension of the data and the development of inference rules
  - Supply center item managers—end users of the knowledge base—who understand the business need for such a capability
  - Supply chain analysts, who understand the DLA acquisition and supply environment, as well as the range of organizations who affect substitution and item-reduction decisions.

In addition to the core team, the team convened a multidisciplinary workshop in which DLA catalogers, industry standards organizations, and military service program offices and engineering support organizations could review and comment on the team's methods and progress to date. The workshop output helped refine and focus the team's follow-on efforts.

Phase 1 clearly demonstrated the feasibility—and promising benefits—of GCAT. At the conclusion of this phase, the O-ring knowledge base included about 2,850 NSNs that have sufficient technical information to enable making intelligent substitution decisions based on a preliminary set of substitution criteria. O-rings can also be searched for and grouped on physical characteristics using a web-based user interface.

These promising results indicate great potential for reductions in customer wait time, as on-hand substitutes may satisfy customer requirements for out-of-stock items. Moreover, savings in inventory, transaction costs, and procurement costs can be realized through a consolidation of buying and inventory practices.

What's Next

Although the WSSP R&D team created a rigorous and robust material taxonomy for the limited scope of the feasibility phase, much work remains to be done. Phase 2, expected to begin in mid-FY06, will require significant effort to populate the knowledge base with additional NSNs, as well as additional data for the existing NSNs, including

- OEM compounds,
- specifications,
- logistics information (back orders, annual demand, stock on hand), and
- weapon system application.

Moreover, development work remains on the specific substitution and item-reduction rules required to identify potential substitutions and item-reduction candidates, potentially including future generic compound substitution across material families. The logic underpinning substitution and reduction decisions will require input from an expanded team of experts that builds on the success of the multidisciplinary workshop.

Ultimately, the ability to identify substitutions will lead to item reduction, which will in turn lead to standardization.

[1]WSSP's mission is to provide tools and methods to improve the delivery of parts and services to DLA customers. Each year, the WSSP solicits the DLA community for R&D project ideas focused on providing such tools and methods. If you have suggestions for R&D projects, please contact the WSSP manager, Cliff Wolfe, at 804-279-4675 or clifford.wolfe@dla.mil.

[2]For more information on XSB Tabled Logic Programming, see http://xsb.sourceforge.net.

About the Authors

Cliff Wolfe manages several DLA logistics R&D programs, including Weapon System Sustainment, Aging Systems Sustainment and Enabling Technologies, and Next Generation Airstart Cart. He also participates in the Joint Council on Aging Aircraft representing DLA/Defense Supply Center Richmond to industry, academia, and service customers.

Michelle Kordell is a research fellow at LMI, a not-for-profit government consulting firm. She provides analytical support to DLA's Weapon System Sustainment Program. In addition, Ms. Kordell has authored several standardization case studies for the Defense Standardization Program Office.

Mark Perry is with the Advanced Materials Research Department at Battelle. He has worked with elastomer and thermoset materials for over 20 years. Before joining Battelle, Dr. Perry worked in the polymer material industry for several companies, including small startups, medium-sized derivatives companies, and large global chemical companies.

Bob Pokorny has worked with XSB, Inc., over the last 8 years developing artificial intelligence and data mining techniques for supply chain sourcing and management, drawing on his extensive background in computer science and mechanical engineering. Before joining XSB, Dr. Pokorny had over 25 years' experience in manufacturing management.

2006 World Standards Day Paper Competition

Recognizing the vital role that partnerships play in the development and use of standards, the theme for the 2006 World Standards Day paper competition is "Standards Build Partnerships." Winners will be announced and given their awards at the U.S. celebration of World Standards Day, which will be held this year on October 11 at the Ronald Reagan Building and International Trade Center in Washington, DC.

The Standards Engineering Society and the World Standards Day Planning Committee award cash prizes for the best three papers submitted. The first-place winner will receive $2,500 and a plaque. Second- and third-place winners will receive $1,000 and $500, respectively, along with a certificate. In addition, the winning papers will be published in SES's journal, *Standards Engineering*, with the first-place winner also appearing as a special article in the *ANSI Reporter*, a publication of the American National Standards Institute.

This year's competition subject is of interest to just about everyone in the standardization community. The standards system in the United States is complex, decentralized, and based on effective collaboration between the private and public sectors, between standards users and standards developers, and between consumers and industry. Specifically, standards build partnerships between buyers and sellers (facilitating communication and market expansion), the public and private sectors (bringing together industries and their regulators), consumers and industry (allowing consumers a say in health and safety issues), as well as among nations (by fostering trade).

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 SAE International and promises to be top notch in every respect. Panels and a preliminary agenda are posted on the DSP website as well as the SAE website. For more information or to register, please go to www.sae.org/events/dsp, or call 724-772-8525.

July 18–19, 2006, Gaithersburg, MD

Options for Action Summit

The Options for Action Summit, hosted by the American National Standards Institute and the National Institute of Standards and Technology, will bring together executives from standards developers and corporations, key government agency representatives, and members of the academic community to identify possible standards-related actions that can make the United States more competitive internationally. Questions and requests for additional information can be directed to Mr. Steven Cornish at 212-642-4969 or scornish@ansi.org.

October 9–13, 2006, Washington, D.C.

World Standards Day "Standards Build Partnerships"

The U.S. Celebration of World Standards Day will be held on October 11, 2006, at the Ronald Reagan Building and International Trade Center in Washington, DC. The event will include a reception, exhibits, dinner, and presentation of the Ronald H. Brown Standards Leadership Award. The administrating organization for this year's event is the Standards Engineering Society. If your organization would like to participate by hosting a table or would like to have a tabletop exhibit, please contact the registration coordinator by telephone (212-642-4956), fax (212-398-0023) or e-mail (registration@ansi.org).

Farewell

Dennis Cross retired in January 2006 after 23 years of federal service, including 21 years as a senior electronics technician in both the former Defense Electronics Supply Center and the Defense Supply Center Columbus (DSCC). Mr. Cross worked in the specification preparing activity function in the Document Standardization Unit at DSCC. He completed hundreds of standardization projects in the established reliability and high-reliability programs for electronic resistors. He was a key player in the effort to convert all the electronic resistor specifications to performance specifications during the acquisition reform efforts. Mr. Cross also worked on the standardization of established reliability and space-level chip resistors and thermistors.

Charles (Chuck) Jarrell has retired after more than 34 years of government service. He served 9 years in military positions in the U.S. Air Force and the Ohio Air National Guard. In addition, he had a 26-year civilian career with DSCC. Mr. Jarrell worked in various administrative and technical positions, most recently as an equipment specialist in the DSCC Lead Standardization Activity group. He received employee of the month awards three times.

John Jones retired from DSCC after more than 36 years of service. He started his service with 4 years in the Navy, including time spent in combat on river patrol boats as a 50-caliber machine gunner in Vietnam. Mr. Jones continued his service as a civilian working for the Defense Logistics Agency in Columbus, OH. He became a certified auto mechanic, serving a 4-year apprenticeship and then becoming a lead heavy mobile equipment mechanic. He was a strong contributor in the standardization management team as a hazardous materials minimization program manager and was one of the first recipients in DLA of a DoD Pollution Prevention Award. His last position was with the DSCC item reduction team were he was recognized by the Defense Standardization Program Office for contributions to the system development of the Item Reduction Web Site Capability (IRWSC).

Eugene Maisano retired from the Defense Supply Center Philadelphia (DSCP) after nearly 40 years of government service. He spent his first 10 years of service with the Navy and the remaining years at DSCP. Mr. Maisano was instrumental in managing the metrication program at DSCP and was acknowledged as a leader in this area. He also directed and managed the engineering and technical services function at DSCP for several years before his retirement.

Promotions

On January 9, 2006, **Michael Radecki** was promoted to chief of the electronics components team in the Document Standardization Unit at the Defense Supply Center Columbus (DSCC-VAT). Mr. Radecki leads and manages the passive electronic components and some of the electromechanical component standardization programs as the specification preparing activity. Areas under his cognizance include high-reliability and established reliability standardization programs on electronic resistors, capacitors, fuses, circuit breakers, crystal and crystal oscillators, relays, filters, and switches. Previously, Mr. Radecki was a lead engineer on the electronic capacitor team. Before joining DSCC, he was an electronics engineer at the then Defense Contract Management Command–Indianapolis and at the Aerospace Guidance and Metrology Center at Newark Air Force Base, OH.

On April 4, 2006, **Belinda Collins** was promoted to director of Technology Services at the National Institute of Standards and Technology (NIST). She had served as acting director since February 2004. Ms. Collins will continue to oversee the organization that provides U.S. businesses and other organizations with measurements, tests, calibrations, technical data, and other resources and services developed at NIST. She has served in various managerial and supervisory roles during her 32 years with NIST. She has also chaired the Interagency Committee on Standards Policy and the board of directors of the American National Standards Institute. Ms. Collins replaces Richard Kayser, who was named director of the NIST Materials Science and Engineering Laboratory.

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
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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