Defense Standardization Program
Journal
April/June 2014

Standardization Stars




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A Uniform Approach to Product Support Analysis
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Cross-Platform Commonality
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Procurement of Spectrometric Graphite Electrodes

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The *Defense Standardization Program Journal* (ISSN 0897-0245) is published four times a year by the Defense Standardization Program Office (DSPO). Opinions represented here are those of the authors and may not represent official policy of the U.S. Department of Defense. Letters, articles, news items, photographs, and other submissions for the *DSP Journal* are welcomed and encouraged. Send all materials to Editor, *DSP Journal*, Defense Standardization Program Office, 8725 John J. Kingman Road, STOP 5100, Fort Belvoir, VA 22060-6220. DSPO is not responsible for unsolicited materials. Materials can be submitted digitally by the following means:

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Director's Forum

Each year, we recognize individuals and teams who, through their standardization efforts, have significantly improved technical performance, increased operational readiness, enhanced safety, or reduced costs.

Individuals and teams are nominated for standardization awards. For FY13, we identified eight as being particularly deserving of recognition. Through their efforts, sometimes taking several years, the winners have played an integral part in keeping our men and women in uniform safe and in providing them the tools they need to get the job done.

The winners are as follows:

- Team from ARL, for revising a federal specification to qualify surface preparation and pretreatments for all metals used across DoD, rather than for steel only, and to allow the use of hexavalent chrome-free technologies and economical green methods
- Kenneth Virgil, from the Logistics Support Activity, U.S. Army Materiel Command, for spearheading the development of an SAE International standard that provides a uniform approach to product support analysis
- Army-led team, with representatives from the Army Research Laboratory (ARL), the Army Aviation and Missile Command, and the Naval Facilities Engineering Command, for developing two performance specifications for environmentally safe and cost-effective cleaners
- Team from the Naval Sea Systems Command's Commonality Program, for using cross-platform requirements as the basis

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for reducing variations, or increasing standardization, among system components and thus avoiding significant costs

- Team from the Naval Air Systems Command's (NAVAIR's) Naval Air Warfare Center Aircraft Division, for developing standards for DoD automatic test systems (ATSs) to improve the interoperability of the services' ATSs
- Navy team from NAVAIR's Naval Air Warfare Center Aircraft Division, for revising a specification to facilitate the production of JP-5 aviation turbine fuel containing advanced biobased components, contributing to the Navy's quest to gain energy independence
- Air Force team from the Air Force Petroleum Agency, for taking the steps necessary for converting to the use of commercially available Jet A fuel instead of MilSpec JP-8 jet fuel, increasing Air Force operational efficiencies and saving millions of dollars, among other benefits
- Team led by the Standardization Program Branch from the Engineering and Technology Division, Defense Logistics Agency Aviation, for revising a standard to enable procurement of high-quality spectrometric graphite electrodes for use in wear-metal analysis of engine oil.

Congratulations to all of our award winners. I know that DoD leadership appreciates your work. These awards help call attention to the significant contributions that standards and standardization make to supporting our men and women in uniform, helping to multiply capability through interoperability, and saving money for the taxpayer.

Standards and standardization link common solutions to common problems across all services and frequently across nations. This issue of the *DSP Journal* showcases the accomplishments of the FY13 award winners. I hope that reading about their accomplishments will pique your interest and might even inspire you to submit an award nomination on the good work you are doing in standardization.

Revised Specification Provides "Green" Methods for Pretreating Metals

Award Winner: ARL Team

A team of engineers from the Army Research Laboratory (ARL)—comprising individuals from the Corrosion and Surface Science Team and the Organic Coatings Team within the Weapons and Materials Research Directorate—revised federal specification TT-C-490E, "Chemical Conversion Coatings and Pretreatments for Ferrous Surfaces (Base for Organic Coatings)." The revised specification contains provisions to qualify surface preparation and pretreatment for all metals used across DoD, rather than being limited solely for steel, as it was under prior revisions. This performance-based specification affects most weapon platforms, ground support equipment, and miscellaneous metal structures, as well as the technical drawings for all of the services and related government agencies. Through the ARL team's endeavors, the new overarching finishing specification allows and encourages the use of hexavalent chrome-free technologies and economical green methods for cleaning and pretreating metals. The team included requirements for objective quality evidence (OQE) to help ensure that the application and verification of finishing processes, along with pretreatments and subsequent coatings applications, comply with the mandatory quality requirements established in the specification. The revised specification, TT-C-490F, "Chemical Conversion Coatings and Pretreatments for Metallic Substrates (Base for Organic Coatings)," was issued in January 2013. It is the only practical official mechanism to validate chrome-free surface finishing operations in DoD.

Background

Beginning in 2007, government agencies have been required to reduce the quantities of toxic and hazardous chemicals and materials acquired, used, or disposed. The key directives are Executive Order 13423 (2007), "Strengthening Federal Environmental, Energy, and Transportation Management"; Executive Order 13514 (2009), "Federal Leadership in Environmental, Energy, and Economic Performance"; and a memorandum, "Minimizing the Use of Hexavalent Chromium (Cr)," issued on April 8, 2009, by John J. Young Jr., then Under Secretary of Defense for Acquisition, Technology and Logistics.

Hexavalent chromium has long been used in coatings for DoD weapon systems. Eliminating this toxic material has significantly reduced the ability of most DoD weapon system programs to mitigate corrosion and has increased costs for repairs of damages to systems caused by corrosion. Viable alternatives to hexavalent chromium were limited, and the prior revision, TT-C-490E, constrained the selection of cleaning methods and pretreatments. In effect, this prevented the use of environmentally friendly technologies, especially those that do not use hexavalent chromium. This gap in metals finishing technologies was exacerbated by the fact that more than 24 military specifications reference TT-C-490E for cleaning and pretreating steel. This gap extended to other metal substrates, in addition to steel, over dozens of finishing specifications, such as MIL-DTL-

53072, "Chemical Agent Resistant Coating (CARC) System Application Procedures and Quality Control Inspection"; MIL-DTL-14072, "Finishes for Ground Based Electronic Equipment"; and DOD-P-15328, "Primer (Wash) Pretreatment (Formula No. 117 for Metals)." Collectively, this meant that DoD was no longer providing effective pretreatment/finishing specifications, resulting in underperforming substrates with increased costs associated with corrosion.

In the absence of official guidance on alternative corrosion-resistant coatings, some programs obtained waivers to continue using hexavalent chromium pretreatments at the expense of compromising the health of DoD workers, soldiers, and the surrounding environment.

Problem/Opportunity

ARL's Corrosion and Surface Science Team and Organic Coatings Team recognized—through their efforts on Environmental Security Technology Certification Program (ESTCP) and Strategic Environmental Research and Development Program (SERDP) projects focused on identifying pretreatments that do not use hexavalent chrome—that TT-C-490E was not suited for the inclusion of the successfully tested candidate pretreatments. Furthermore, there was no formal path for approval, nor was there an assigned group of subject matter experts (SMEs) to help suppliers adopt new, viable, commercially available pretreatments into the system. ARL accepted that responsibility, taking ownership of the specification.

The ARL team recognized a unique opportunity to accept all metals into TT-C-490 while concurrently maintaining legacy systems, rather than writing a new specification. A new specification would require changing dozens of existing specifications and thousands of drawings. The team also wanted to establish TT-C-490 as a "living" document with a flexible foundation supported by an integrated management group to keep pace with emerging chrome-free technologies. Finally, the team realized that a fair and robust structure for approvals was needed and would include a qualified products database (QPD) to log and maintain the types of pretreatments, the approved processes, and the particular aspects of their application.

Approach

The ARL team convinced program managers from across DoD—including SERDP; the Army Research, Development and Engineering Command; the Army Specifications and Standards Office; the Naval Air Systems Command; and the Marines Corps—to fund this 4-year effort to demonstrate how a revised TT-C-490 specification would save money, reduce corrosion, and reduce the environmental footprint across all services.

The ARL team canvassed the finishing and coatings community, inviting counterparts at other government agencies, original equipment manufacturers (OEMs) and suppliers, and pretreatment chemical suppliers, to collect and synthesize ideas to develop a new approach to TT-C-490. The team's inclusive, innovative, and participative approach involved dozens of SMEs in formulating a specification that is more serviceable and supportable than the earlier version and that addresses the directives in Executive Orders 13423 and 13514 and in the April 2009 memorandum issued by John J. Young Jr.

As part of its development of the specification, the ARL team strengthened the quality assurance aspects of the application procedures. For example, the team included, within the specification, OQE tenets (in a readily available and easily understood format) on verifying and controlling the cleaning, pretreatment, and coating systems for verification by government field representatives. New cleaning methods were approved for use with pretreatments to promote better surface finishing and reduce hazardous materials. New types of pretreatments were listed to improve performance for steel and other metallic substrates. New classes of metal applications were established to better control the descriptions for types of substrates and the corresponding processes.

During its investigation to find possible candidates for populating a QPD, the ARL team, through synergy with ESTCP and SERDP projects on toxic metal reduction, identified several viable zirconates, silanes, and organic washes that equaled, and, in some cases, surpassed, the performance ratings of the legacy systems when tested in accordance with the requirements of TT-C-490.

Finally, the team developed a formal path for material approvals. Several candidate suppliers have, with ARL's support, been guided through the qualification process and are now listed on the QPD.

The draft TT-C-490F was coordinated twice. The resulting document is the only practical, official mechanism to validate chrome-free surface finishing operations in DoD.

Outcome

The ARL team published TT-C-490F in January 2013 with an accompanying QPD for listing and controlling approved pretreatment processes and materials available to all services, manufacturing centers, and allies. The updated specification freed equipment manufacturers to select from among multiple chrome-free solutions. Further, it enabled the seamless transition of new environmentally green, chrome-free technologies to programs using nothing more than a routine engineering change notice, sparing the expense of changing thousands of finishing drawings. This single, consolidated pretreatment specification can be used to set the pretreatment needs for all metals on multiservice platforms,

such as heavy armor, self-propelled howitzers, munitions, light armored vehicles, and other tactical and ground support equipment. New and innovative technologies can be proposed to ARL for possible inclusion in the QPD. The OQE, in conjunction with regular certified testing, will provide verifiable maintenance of applicator competencies.

TT-C-490F has significant benefits. Unlike the old technologies, the new chrome-free technologies do not require numerous heated baths, thereby greatly reducing energy needs for pretreatment application and reducing costs while improving environmental aspects. Energy costs can be cut by nearly 50 percent through the application of some of the new green technologies. And in several cases, the hexavalent chrome-free pretreatments outperform the legacy systems in corrosion resistance, which can lead to cost reductions in refinishing of assets because of corrosion.

Likewise, with the hazardous materials removed from the processes, hazardous waste will, in some cases, be reduced to zero. The underlying flexibility of TT-C-490F will allow for toxic pretreatment specification holdouts such as DOD-P-15328, the current hexavalent chrome-containing wash primer, to be canceled when viable replacements are qualified in the QPD. Through ARL's efforts, hexavalent chrome-free pretreatments and other approved materials identified in the ESTCP and SERDP projects are now available for use under TT-C-490F. Their use will lead to the elimination of 12 tons per year of toxic heavy metals, 1,200 tons per year of volatile organic compounds, and 426 tons per year of hazardous air pollutants (HAPs) (approximately 10 percent of all Army HAPs), while extending the projected number of years of fielding before repainting from 3 years to 5 years. Finally, workers who prepare and refurbish assets, as well as soldiers who use them, will not be exposed to toxic materials in the pretreatments for metal.

Annual savings attributable to the revised specification total more than $400 million, realized through the reduction in the use of toxic metals and the associated costs of disposing of hazardous waste and protecting workers, energy cost reductions in pretreatment processing, and estimated cost avoidance for asset drawing changes.

Current Status

TT-C-490F is an implemented, functioning specification, with ARL receiving regular inquiries for qualification. The ARL team manages and shepherds users of the specification through the formal qualification program.

Three pretreatments have been qualified and are listed on the QPD. Pretreatments from three other companies are in the last stages of evaluation; one of them will be qualified to TT-C-490F Type III as a replacement for chromated wash primer DOD-P-15328. Several other companies are in the preliminary stages of having their pretreatment candi-

dates evaluated. Ultimately, numerous pretreatment solutions will be available, reducing DoD's cost of corrosion and the Army's environmental footprint without increasing costs or decreasing competition.

In addition, contracts for surface finishing of weapons platforms are often established on a multiyear basis. These contracts generally use the most up-to-date specifications when the contract is established. As a result, the ARL team has completed a profound change to the specification as is apparent from the many OEMs and suppliers that have already sought qualification.

TT-C-490F represents the basis for the future of surface preparation and finishing and will result in additional new and novel chemistries that will help to eliminate toxic metals and minimize life-cycle costs for DoD and the private sector.

Challenges

The ARL team had numerous challenges in the form of stakeholders being reluctant to change. Mired in obsolescence, TT-C-490E had an ingrained culture of well-meaning SMEs who had to be persuaded on a new approach: use of a performance-based specification. Over the 4-year period of this project, the team spent many hours of laboratory and field validations to demonstrate and sell the concepts to DoD stakeholders. The team also undertook many one-on-one negotiations and frequent networking. Ultimately, the team was able to convince the DoD community to endorse TT-C-490F, a sustainable and manageable specification for surface preparation and pretreatments. The negotiations also helped spawn the idea of OQE to help protect the legacy systems.

About the Award Winner

The ARL team consisted of Tom Braswell, Tom Considine, and Chris Miller—all members of the Corrosion and Surface Science Team—and Fred Lafferman and William Lum, who are members of the Organic Coatings Team.

Tom Braswell, before assembling the ARL team, gathered ideas from stakeholders in the field and from government contacts. He produced the first draft of TT-C-490F and led the ARL team through the process of refining the specification, coordinating the draft twice, and then finalizing the specification for publication.

Tom Considine collated, organized, and maintained more than 300 editorial and technical comments from the document coordination efforts. He edited the specification and contributed especially to its corrosion-related sections.

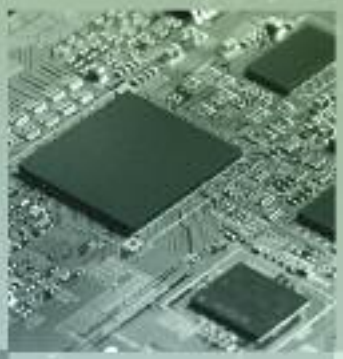
Chris Miller, steward of TT-C-490E, assisted with the development of TT-C-490F, while ensuring the team maintained the integrity of the legacy systems.

Fred Lafferman assisted with the development of TT-C-490F, including enhancing it to serve as a foundation for MIL-DTL-53072E.

William Lum assisted with the development of TT-C-490F and acted as specifications coordinator for negotiating and synchronizing the efforts of the team through the two coordination efforts and the specification's eventual publication.

A Uniform Approach to Product Support Analysis Leads to Operational Benefits

Award Winner: Kenneth Virgil



Kenneth Virgil, from the Logistics Support Activity (LOGSA), U.S. Army Materiel Command (USAMC), spearheaded the development of an SAE International standard, SAE TA-STD-0017, "Product Support Analysis," and a companion DoD document, MIL-HDBK-502A, *Product Support Analysis*. The handbook contains guidance on DoD's implementation of the industry standard. For example, it identifies the types of analyses required to define the support system for a new product, defines the product support analysis (PSA) framework and activities as an integral part of the systems engineering process, and addresses the selection and tailoring of those activities to meet DoD program supportability objectives. It also contains sample contract language for acquiring PSA deliverables. The industry standard and military handbook fill a critical gap—the lack of a standardized method to define and convey PSA requirements to industry partners—experienced by DoD, the Federal Aviation Administration, NASA, the Missile Defense Agency, and the U.S. Coast Guard. Now, they have a single, uniform approach for performing and contracting for product support analysis over the life cycle of a weapon system. By following the industry PSA standard and military handbook, DoD will reduce costs, improve performance, and increase the timeliness of product fielding, all leading to operational benefits.

Background

MIL-STD-1388-1A, "Logistics Support Analysis," was originally established as the definitive standard to be used by all services to provide a single, uniform approach to logistics support analysis (LSA) as an integral part of systems engineering over the life cycle of weapon systems and equipment. However, in May 1997, in conjunction with Acquisition Reform initiatives, MIL-STD-1388-1A was superseded by MIL-HDBK-502, *Acquisition Logistics*. The cancellation of MIL-STD-1388-1A left a gap in the ability of product developers to gain insight into the analytical tasks required to develop the data elements needed to support the product being acquired, to gain insight into the robustness of the analyses, and to contract for the required analyses.

Over the years, the focus of acquisition shifted away from supportability to the point that product support was being neglected in acquisition and logistics transformation efforts. Weapon system development programs required delivery of logistics support products but did not have the ability to determine if the product was developed via a systems engineering approach. Logistics products and supporting analyses were left to the contractor to decide whether or not a rigorous analysis was performed. The military services had little insight into the rigor of the industry processes. Further, DoD did not have a consistent method for placing the requirements on contract. Finally, over time, DoD lost much of the knowledge about identifying and performing the required analyses.

The November 2009 *DoD Weapon System Acquisition Reform: Product Support Assessment* (referred to as the WSAR report) shifted the emphasis back to the importance of implementing sound product supportability plans. Product support requires a life-cycle management focus, committed leadership, and cooperation among the operational, acquisition, and logistics communities. A weapon system program may no longer focus only on the technical performance capability of the system. Instead, the program must also address system sustainment and affordability. Failure to optimize reliability, availability, and maintainability not only affects the supportability of the weapon system, but places a financial burden on the system program during operations and support. It also risks a catastrophic event in which the loss of life may occur.

Despite the shift in emphasis back toward supportability, system programs and their support contractors still lacked guidance on the performance of product support actions. In an attempt to fill that gap, they began using canceled military standards.

Problem/Opportunity

In October 2010, the Defense Standardization Council (DSC) formed an Inter-Service/Agency Standards Working Group. That group subsequently identified the cancellation of MIL-STD-1388-1A as a "Category 1–Obvious Candidate for Reassessment." Mr. Virgil recognized DSC's Category 1 designation for MIL-STD-1388-1A as an opportunity to reintroduce a standard approach to identifying the logistics-related analyses that must be accomplished on every weapon system development contract to ensure high-quality support products. He also recognized the need for guidance on establishing a common frame of reference for the total system, including the prime mission equipment; the soldier, sailor, airman, or marine who will operate or maintain the system; the logistics support structure for the system; and the other elements of the operational support infrastructure within which the system must operate.

Approach

The first step in the effort to address the capability gap by developing a single, uniform PSA approach was to carry out a business case analysis (BCA) of the reinstatement of the canceled MIL-STD-1388-1A. The purpose of the BCA, done by Mr. Virgil, was to show proof that this type of standardization was needed and would benefit not only the Army, but all of the uniformed services. Developed, vetted across the Army, finalized, and submitted to the DSC in May 2011, the BCA recommended that the canceled standard not be reinstated "as is"; instead, it recommended that it be rewritten to accommodate the changes in national and international product support policy since 1997, such as the increased focus on product obsolescence. The BCA also reaffirmed the DSC's Category 1 assessment that the cancellation of MIL-STD-1388-1A resulted in a significant gap: the

lack of a single, uniform method (standard) that provided a mechanism or vehicle for accomplishing the analyses and the integration of related analyses.

Following the completion of the BCA, the Office of the Secretary of Defense (OSD) formed, and served as chair of, the Logistics Support Analysis Working Group (LSA-WG), with representatives from each of the military services. Mr. Virgil was selected as the representative for the Army, the lead to develop the replacement solution. The LSA-WG met several times during the summer and fall of 2011. All the military services agreed that the cancellation of MIL-STD-1388 had a negative impact on their LSA process, but they disagreed on how to proceed. Mr. Virgil was able to get the services to agree to a single recommendation for writing a new PSA standard that was tailorable for each program's requirements. Despite the unanimous recommendation of the LSA-WG service members, the OSD chair of the LSA-WG recommended that the development of a single, uniform approach be moved to the Product Support Assessment Team (PSAT) for Analytical Tools to continue the gap analysis and to carry out deep-dive analyses of specific programs to quantify and codify the impacts of not having a standard. DSC concurred. Therefore, the effort was passed to the Office of the Deputy Assistant Secretary of Defense for Materiel Readiness, DASD(MR), for the creation of a Sub-Integrated Product Team (IPT) composed of service representatives from the PSAT.

Mr. Virgil was instrumental in two parallel, interrelated efforts—development of the industry standard and development of the military handbook—that occurred in the same time frame:

- *Development of the industry standard*. The chair of SAE International's Life Cycle Logistics Supportability (LCLS) Committee contacted Mr. Virgil about leading a project to write a PSA standard for industry. The project was approved at the February 2012 LCLS meeting. Mr. Virgil immediately reached out to the services (Army, Navy, Air Force, Coast Guard, and Defense Logistics Agency) and created a collaborative environment with industry in the form of a joint service–industry subcommittee—the LCLS PSA Subcommittee—to develop the new standard. As chair of the subcommittee, Mr. Virgil was the primary author of the new standard, SAE TA-STD-0017. During the standard's development, he saw an opportunity to ensure that assessment of cost and technical risks arising from product obsolescence was included as an activity in the new standard. As a direct result of his leadership and foresight, Mr. Virgil obtained TechAmerica's approval for publication of SAE TA-STD-0017 in November 2012. He also shepherded the document through the American National Standards Institute (ANSI) process, receiving ANSI approval in January 2013, as well as the approval of SAE International. He then took steps to ensure the standard's adoption by DoD and its integration into DoD ASSIST for use by DoD, the military services, and industry. DoD adopted the standard in June 2013.

- *Development of the military handbook*. Mr. Virgil was selected to represent the Army on the DASD(MR) Sub-IPT performing the deep-dive analyses. DASD(MR), the Sub-IPT chair, tasked the team to develop a supportability analysis contracting guidebook for use by the services. Mr. Virgil convinced the DASD(MR) and the services that DoD would be better served by a military handbook that provided guidance on implementing SAE TA-STD-0017. Members of the Sub-IPT unanimously agreed. Mr. Virgil was the primary author of the handbook, MIL-HDBK-502A, and managed/coordinated joint service activities to produce the handbook. The document was staffed with the DASD(MR); Joint Project Manager, Joint Strike Fighter; Defense Procurement and Acquisition Policy; Defense Acquisition University; DoD Systems Engineering; Supply Chain Integration; Logistics and Materiel Readiness; Maintenance Policy and Programs; Office of the General Counsel; Secretary of the Army for Acquisition, Logistics and Technology; U.S. Army Materiel Command; and other agencies/activities. All offices concurred with the publication and, in several instances, began to immediately implement the usage of the draft handbook without awaiting final publication. As a result of Mr. Virgil's outstanding leadership, knowledge, and steadfast commitment, MIL-HDBK-502A was published (superseding the outdated May 1997 MIL-HDBK-502) and adopted into ASSIST in March 2013.

Those two documents, along with SAE GEIA-STD-0007, "Logistics Product Data," contain the information needed by logisticians to establish viable, cost-effective support structures that reduce risk and enable them to meet performance and schedule requirements, ensuring the sustainment of all weapon systems throughout their life cycle.

Outcome

As a result of Mr. Virgil's actions, the U.S. Government and industry now have a uniform standard approach (SAE TA-STD-0017) and DoD-wide implementation guidance (MIL-HDBK-502A) identifying and tailoring the analysis activities and the contracting for PSAs. Those two documents, along with SAE GEIA-STD-0007, "Logistics Product Data," contain the information needed by logisticians to establish viable, cost-effective support structures that reduce risk and enable them to meet performance and schedule requirements, ensuring the sustainment of all weapon systems throughout their life cycle.

SAE TA-STD-0017 establishes general PSA principles, presents general requirements for PSAs, and describes the logical, iterative activities governing PSAs during the product life cycle. It also provides clear contracting language that can be used to acquire PSAs. Intended for use by both industry and U.S. Government entities, SAE TA-STD-0017 applies to all system acquisition programs, major modification programs, and applicable research and development projects.

MIL-HDBK-502A addresses the overall PSA process and its associated activities, the selection and tailoring of those activities to meet U.S. Government program supportability objectives, and sample contract language for acquiring PSA deliverables. The handbook offers guidance on PSA activities as an integral part of the overall systems engineering process. The focus of the handbook is to provide guidance to the members of the acquisition workforce who are responsible for the supportability of materiel systems or automated information systems. MIL-HDBK-502A also contains guidance on how to contract for PSAs and how to secure appropriate data rights to ensure the supportability of a system in the future.

With a systematic PSA approach, the services will be able to build efficient and effective support structures for its weapons systems that will improve system readiness and result in large life-cycle cost savings. The services also will receive the benefits of the standard and the companion handbook due to their facilitating contracting, ensuring the uniformity of the data and reports being generated.

The bottom line? Together, the two documents influence product support by reducing cost, improving performance, and increasing the timeliness of product fielding, all leading to operational benefits for DoD.

Current Status

SAE TA-STD-0017 was published by SAE International in November 2012 and adopted for use in DoD in June 2013. MIL-HDBK-502A was published in March 2013. Both documents have been adopted in ASSIST.

Challenges

The primary challenge in creating a single, uniform approach to PSA was achieving consensus and buy-in among the various stakeholders. Mr. Virgil successfully met that challenge. For example, he steered a joint service–industry subcommittee, formed by TechAmerica, through diverse discussions, avoiding service-unique requirements and resolving disagreements to complete the standard and gain approval through an SAE ballot.

In addition, he guided the DASD(MR)-led PSAT Sub-IPT whose strong senior-level personalities were focused on developing alternate courses of action that were insufficient and failed to address core issues outlined in the WSAR report. Ultimately, he achieved concurrence about developing a PSA handbook, including contracting guidance that would serve the needs of the U.S. Government better than a general supportability analysis contracting guidebook.

Despite indications from some individuals that the standard and handbook would never come to fruition, as well as attempted roadblocks and diversions, Mr. Virgil's personal drive and depth of expertise was instrumental in changing opinions and gaining concurrence from OSD, Department of the Army, USAMC, all military services, and industry.

About the Award Winner

Kenneth Virgil is a logistics management specialist at LOGSA. His depth of knowledge, experience, and expertise in the field of life-cycle logistics and standards allowed him to distinguish himself as a leading authority in these matters. He also co-chairs SAE International's LCLS Committee and is the deputy secretary to ISO TC 184/SC 4 on industrial data. That subcommittee is responsible for the ISO, "10303 Standard for the Exchange of Product Model Data (STEP)," family of standards, which is one of the most widely used standards in DoD.

New Performance Specifications Provide for Environmentally Safe and Cost-Effective Cleaners

Award Winner: Army–Led Team

A team led by the U.S. Army Research Laboratory (ARL), with representatives from the Army Aviation and Missile Command (AMCOM) and the Naval Facilities Engineering Command (NAVFAC), developed two performance specifications for environmentally safe and cost-effective cleaners. One of the specifications addresses cleaners for ground vehicles and support equipment, and the other addresses cleaners for aviation and missile systems. Both specifications are free of hazardous air pollutants (HAPs) and contain no or low amounts of photo-reactive volatile organic compounds (VOCs). The specifications will enable DoD to obtain environmentally safe cleaners and cleaning processes that do not have the materials compatibility issues or process impacts of cleaners containing HAPs or VOCs. The specifications will also enable DoD to cut its cleaning costs, which have increased substantially as the restrictions on the use of HAPs and VOCs have tightened and as environmental controls and reporting requirements have increased. The specifications can be readily adapted as new regulations are promulgated, enhancing DoD's ability to adapt to changing regulatory environments. In addition, the specifications fill the gaps between existing cleaning specifications across military branches.

Background

Periodic cleaning to remove soils (dirt, grease, soot, burned-on carbon, and so on) from various components of DoD systems—ground vehicles, aviation/missile systems, ships, and support equipment—is required to properly maintain system functionality, improve system readiness, and facilitate various maintenance and inspection procedures. Historically, the services have cleaned their systems by using various solvents, such as P-D-680–type solvents, Stoddard solvents, and highly refined aliphatic hydrocarbon compounds. Not only are those chemicals not environmentally accepted by today's standards but they have an environmental impact in terms of toxicity, flammability, and hazardous waste. Other problems associated with current solvents are their strong odor (indicating high VOCs) and dermal reaction.

Over the years, concern has been increasing over the adverse effects of chemicals on human health and the environment. As a result, the use of HAPs and VOCs has been increasingly restricted. That, in turn, has made the use of many organic cleaners increasingly expensive due to the need to meet environmental controls and reporting requirements to comply with the more stringent regulations. Nevertheless, DoD has continued using these substances because of issues with compatibility and the effects of cleaning processes on systems. For example, a 2002 survey found that 14 Army facilities used a total of more than 46,000 gallons of HAP/VOC-containing cleaners. The number of gallons would be considerably larger if the usage by other DoD facilities (Navy, Air Force, Marines, etc.) was considered. The number would be even higher in subsequent years if accounting for cleaning and refurbishment of systems for use in Iraq and Afghanistan.

Problem/Opportunity

Existing specifications for DoD cleaners typically prescribe very specific types of cleaners and applications, and they do not address current regulatory mandates, such as National Emission Standards for Hazardous Air Pollutants (NESHAPs). General cleaning specifications that identify cost-effective cleaners and simplified cleaning processes and that address the new environmental mandates were desperately needed. To meet that need, the Joint Service Solvent Substitution (JS3) Working Group—a collaboration of branches of the military as well as NASA—established a multi-service group of specialists, tasking them to develop a general cleaning performance specification that simplifies cleaning maintenance documents and enhances DoD's ability to adapt to changing regulatory environments.

Approach

The multi-service group of specialists began its work in early 2008. As a starting point, the group reached agreement on meaningful and manageable classes and types of cleaners. It then identified performance requirements for a range of multi-service applications for military ground and support vehicles and equipment, while keeping in mind that the specifications should not be unreasonably complex.

The group also developed requirements for hand-wipe cleaners for aviation and missile systems. This required coordination with all Army-related aviation and missile organizations to determine their cleaning requirements, including the appropriate classes and types of cleaners for all aerospace and missile end items/components and equipment as defined by NESHAPs for aerospace manufacturing and rework facilities and for Defense Land Systems and Miscellaneous Equipment (DLSME).

In addition, the group obtained consensus regarding all test methods and requirements, and it identified laboratories capable of performing the required tests, as well as the cost of testing. The group also obtained approval from DSPO for listing cleaning products in the qualified products list (QPL) and qualified products database (QPD) by justifying the cost advantages of QPD testing over first-article testing.

Ultimately, the group developed two specifications:

- MIL-PRF-32359, "Cleaner, General, for Ground Vehicles and Ground Support Equipment, HAP-Free"
- MIL-PRF-32405(MR), "Cleaner, Hand Wipe, for Aviation and Missile Systems, Metallic Substrates, Low or Exempt VOC."

Outcome

The two specifications developed by the multi-service group are noteworthy, because they combine current regulatory requirements for cleaning agents with standardized performance and analytical tests. Below is an overview of specific areas addressed in the two specifications that make them so valuable:

- *Chemical, regulatory, and physical properties.* MIL-PRF-32359 covers general cleaners (excludes petroleum products) that are HAP free and may contain either a low content of VOCs or are composed entirely of exempt VOCs. The specification characterizes the cleaning agents at the as-used dilution. Cleaners are either Class 1, aqueous (containing water), or Class 2, non-aqueous (not containing water). This distinction is important because aqueous cleaners can be primarily water, or they can be primarily organic or inorganic materials. Cleaners are further subdivided into six types, characterized by VOC content and vapor pressure. The intent was to encompass major current federal, state, and local regulatory standards. It is important to do this because such standards are diverse and sometimes conflicting. The division into types will make it easier for facilities to adopt the cleaning agent appropriate for their specific regulatory microclimate. Of course, as environmental regulations evolve, future revisions are conceivable that will include modifications or additional VOC/vapor pressure types and limits. Finally, this specification divides the cleaning agents into three grades based on evaporation rates relative to n-butyl acetate. This reflects the reality that in some applications, the cleaning agent has to dwell on the part or component for a significant amount of time. In other cases, the cleaning agent must evaporate rapidly, leaving no significant residue and minimizing outgassing issues. The general cleaners specified by MIL-PRF-32359 can be used on military ground and support vehicles and equipment. The cleaning methods include immersion, spray, and hand wipe.

  MIL-PRF-32405(MR) covers cleaning compounds that are intended to be used for hand-wipe cleaning on metallic substrates prior to painting, metal surface treatment, nonstructural sealant application, or adhesive bonding. The hand-wipe cleaners are HAP free and contain a low content of VOCs or exempt VOCs. The scope ensures that the solvents specified are compliant with the DLSME and NESHAPs for aerospace manufacturing and rework facilities, as well as with all state regulations, including the most stringent. The hand-wipe cleaning compounds specified in MIL-PRF-32405(MR) can be used on land, aviation, and missile systems (end items/components and equipment).

- *Testing.* The specifications include physical, chemical, and performance testing requirements, including standards and proscriptive requirements. They call out third-party testing and provide a non-exclusive list of available testing laboratories. The

specifications also call out industry specifications such as those published by ASTM International, other military and federal specifications, and regulatory-related documents such as South Coast Air Quality Management District methods. Requirements are extensive and include a number of tests for corrosion and for specific materials compatibility. The specifications even include a table indicating the approximate cost and the volume of cleaning agent needed for each required test.

- *Efficacy of cleaning.* The specifications include cleaning performance requirements. One limitation of many regulatory-based specifications is that, although they may specify such things as allowable VOC or HAP content, they do not set minimum requirements as to how well soil is removed. MIL-PRF-32359 specifies a minimum cleaning efficiency of 75 percent. The test method is based on FED-STD-791, "Testing Method of Lubricants, Liquid Fuels, and Related Products," Method 7502, which involves using ultrasonic cleaning to remove a standard soil. Because ultrasonic cleaning systems can have many different properties, MIL-PRF-32359 calls out parameters for the ultrasonic system. Although 75 percent cleaning efficacy is low for many critical cleaning applications, the approach can be adapted to the manufacture or repair of other products, or the contract can specify a higher percentage and still call out MIL-PRF-32359 for all the other requirements. For example, medical device manufacturers would want to be very rigorous in specifying cleaning efficacy in terms of both the cleaning agent and process conditions. Further, the specifications could be used as a discriminator for manufacturers trying to sort through the plethora of possible cleaning agents. In the history of critical cleaning, it is not unknown for suppliers of cleaning agents to test their products at a sufficiently low concentration that it meets environmental restrictions, whether or not the product could actually remove soil under those conditions. With the new specifications, manufacturers could at least rule out cleaning agents that, at the dilution and conditions of test, did not achieve 75 percent cleaning efficacy.
- *Toxicity.* The specification contains proscriptions against using HAPs and against using known carcinogens, as indicated in the current National Toxicology Program report.
- *Process.* In general, the specifications are concerned with the cleaning agent; they do not specify the cleaning process to be used. Although the test for efficacy of cleaning uses ultrasonics, the specifications indicate that the actual cleaning method should be identified as being immersion, spray, or hand wipe.

Current Status

Both specifications have been published—MIL-PRF-32359 in August 2012 and MIL-PRF-32405(MR) in January 2013—and are available from the ASSIST Online Database at https://assist.dla.mil/. The team also created administrative notices for the QPL/QPD under each performance specification. These notices indicate that the base document

contains requirements for qualification products, that sources have been established, and that each document's QPL/QPD is ready to be populated with acceptable products that have passed all the qualification requirements listed in each specification.

The publication of these specifications enables the military services to identify and access environmentally safe and cost-effective cleaners and cleaning processes. The specifications will be incorporated into revised technical manuals and will be adapted to new regulations as they are promulgated, enhancing DoD's ability to adapt to changing regulatory environments.

Challenges

Initially, the biggest problem associated with the development of the two performance specifications was the level of standardization funds. The team requested standardization funds, but due to the limited availability of funds, the team had to extend completion of this effort by almost 2 years.

The other primary challenge occurred in the coordination process of MIL-PRF-32359. Multiple organizations, such as the Navy and Air Force custodians, Army, Navy, Air Force, Defense Logistics Agency (DLA), and General Services Administration, among others, reviewed and concurred with the draft. However, one government respondent did not concur; specifically, it provided an "essential" comment citing duplication with no advantage. ARL, NAVFAC, and the Naval Sea Systems Command reviewed the essential comment; held teleconferences to discuss it; and offered and rejected rebuttals. Eventually, the comment was downgraded to "suggested," enabling the specification to continue toward publication, but not after many months of delay.

About the Award Winner

The Army-led team consisted of Richard Squillacioti, Dennis Helfritch, and Wayne Ziegler, all from ARL's Weapons and Materials Research Directorate; Tom Torres from NAVFAC; and Leslie Hasenbein from AMCOM.

Richard Squillacioti led the standardization effort, which included initiating the effort, preparing the justification packages to obtain approval by the Army's Departmental Standardization Officer, and overseeing final publication of each document. He reviewed all of the states' regulatory requirements to ensure that each specification offered a specific class of cleaners that could be used in each state. As is the case with any standardization effort, Mr. Squillacioti investigated the need for these documents by finding sponsors within the government that have or will have items or platforms that are in production or that will be in production in the near future. This ensures the use and implementation of the specifications' products. He coordinated each of these actions with industry and government representatives on multiple occasions and with multiple drafts of the documents. He reviewed and documented all the comments received during each of the coordination rounds. He regularly made presentations to the JS3 Working Group outlining the status of the documents.

Dennis Helfritch assisted in developing requirements for both documents, finding testing facilities, and documenting cost and contact information. He evaluated the appropriateness of all required tests and modified them, as necessary. Dr. Helfritch worked closely with all members of the working group, ensuring that their concerns were addressed.

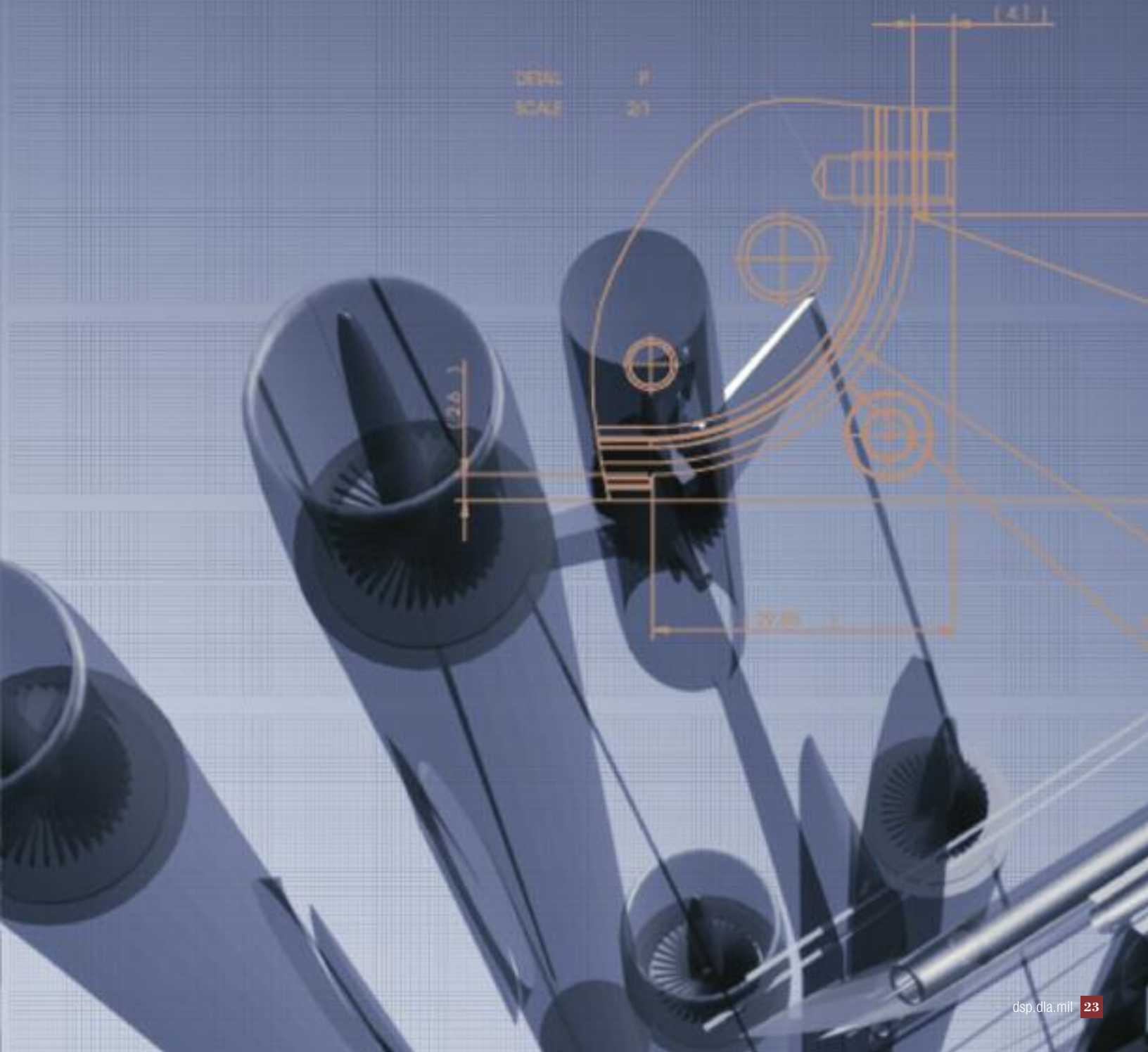
Wayne Ziegler, a founder and co-chair of the JS3 Working Group, solicited and coordinated the technical input from DoD, NASA, Environmental Protection Agency, and industry to ensure that the specifications met the requirements of both the weapon system owners and the end users. Under his leadership, the JS3 Working Group leveraged efforts funded by the Navy, Army, NASA, and DLA to develop specifications that fill a critical gap in DoD operations and maintenance procedures. Mr. Ziegler's coordination with industry and regulatory agencies ensured that the specifications will remain relevant in spite of the fluid regulatory environment surrounding the use of solvents and cleaners.

Tom Torres focused on developing the requirements for MIL-PRF-32359. He reviewed federal and state environmental regulations affecting DoD cleaning operations. He analyzed the NESHAPs to develop the requirements necessary for compliance and carefully studied the varying state VOC regulations. This ensured the incorporation of the federal NESHAPs and the states' VOC requirements into the specifications in a manner that made sense and was easy to follow. In addition, Mr. Torres ensured the incorporation of the Navy's requirements in MIL-PRF-32359.

Leslie Hasenbein focused her efforts on MIL-PRF-32405(MR). She worked with the team to develop performance requirements that would ensure that aviation/missile flight-critical parts would not be damaged during cleaning using alternative solvents. At In-Process Reviews for Corpus Christi Army Depot and Fort Rucker Aviation Center Logistics Command, Ms. Hasenbein gave presentations outlining the status of the documents, ensuring that the Army aviation community learned about the new specifications and understood their value.

New Standards for DoD Automatic Test Systems Improve Interoperability

Award Winner: NAVAIR Team



An Integrated Product Team (IPT) from the Naval Air Systems Command's (NAVAIR's) Naval Air Warfare Center Aircraft Division identified the need for industry standards in DoD automatic test systems (ATSs). For 15 years, the team has been the driving force for developing the standards, using a framework based on an open systems approach so that all of the services use the same industry interface standards. The NAVAIR IPT spearheaded efforts to identify and define the interface elements that need to be standardized to ensure the interoperability of the services' ATSs. In addition, the IPT worked with industry to identify current standards that could meet the purpose of each element and to develop standards that would meet the needs of both DoD and industry. The team also worked to convince industry of the value of the open systems approach to ATS interoperability, and it provided guidance to the DoD acquisition community on implementing an open systems approach in future ATSs. The military services are now beginning to implement those standards in their ATSs. The open systems approach makes it easy to adopt state-of-the-art ATS technologies, improves performance, enables quick fielding of systems, and reduces effort to replace obsolete components. Together, those benefits will help reduce ATS life-cycle costs.

Background

DoD established an ATS Executive Directorate (ED) with the following goals: (1) minimize the cost of automatic testing to DoD; (2) foster interoperability of ATSs across the services; (3) reduce the logistics footprint; and (4) improve the quality of testing by leveraging embedded and other diagnostic data. To meet those goals, the ED created an ATS Management Board (AMB), which, along with its associated IPTs, works to advance state-of-the-art ATS technologies and to incorporate open systems approaches in ATS solutions. The ATS Framework IPT, led by NAVAIR, is one of the IPTs established to help steer future ATS designs that meet DoD's ATS goals.

Problem/Opportunity

Current test solutions—automatic test equipment (ATE) and the associated test program sets (TPSs)—are designed for specific platforms. As such, these platform-specific test solutions are not adaptable to other platform ATSs, limiting interoperability among ATSs across the DoD services. Although the testers have similar capabilities, the differences in system architectures, test languages, internal instruments, and interfaces limit the ability for the services and coalition partners to leverage each other's ATSs.

A major contributor to the lack of ATS interoperability is the independence of acquisitions by the services. Acquisition independence is inherent in DoD, because each service acts independently to meet its mission and because each service's weapon systems, in which the units under test (UUTs) reside, are quite different (for example, ground vehi-

cles versus aircraft). Therefore, the services typically specify the requirements for their particular ATS without considering potential applicability to the other services.

Another contributor to the lack of ATS interoperability is the lack of adherence to industry standards. Many standards exist, but they are not being incorporated in ATS acquisitions. And in some areas, no standard exists or is not directly applicable to ATSs.

In addition to their lack of interoperability, legacy ATSs have other problems. For example, the cost to develop, support, and modify ATE and TPSs is high. In addition, it is difficult to insert new technology or replace obsolete components.

The ATS Framework IPT recognized that no one ATS could ever be defined that meets all the operational needs of all the services. A more feasible approach to establishing interoperability across the ATSs is to use an open systems approach in which all of the services use the same industry interface standards. Such an approach has several benefits:

- State-of-the-art technologies can be implemented easily, because the interface standard is independent of the desired technology.
- Performance will be improved, because the most efficient solutions can be integrated using the common interface.
- Systems can be fielded more quickly due to the enhanced ability to purchase commercial off-the-shelf items.
- Obsolescence can be reduced, because instruments can be more easily replaced with new versions, as long as both the original and the updated versions comply with the standard interfaces.

Together, all these benefits will help reduce ATS life-cycle costs.

Approach

The NAVAIR IPT's first step was to identify the key elements (interfaces) necessary to implement an open systems approach to ATS interoperability in support of the goals of the ED. Ultimately, the team defined 23 key elements that should be standardized. Table 1 lists them, categorized by type: TPS, ATE, and UUT.

After defining the elements, the IPT worked with industry to identify current standards that could meet the purpose of each element and to develop standards that would meet the needs of both DoD and industry. The IPT worked most closely with the Institute of Electrical and Electronics Engineers (IEEE) Standard Coordinating Committee (SCC) 20 to define several standards, such as IEEE-1671, "Automatic Test Markup Language"; IEEE-1641, "Signal and Test Definition"; IEEE-1232, "Artificial Intelligence Exchange and Service Tie to All Test Environments"; and IEEE-1636, "Software Interface for

Maintenance Information Collection and Analysis." The IPT also worked with other industry standards working groups, notably the VXI Plug and Play and Interchangeable Virtual Instruments (IVIs). Standards development is a slow and tedious process, which requires that all stakeholders be satisfied with the standard before it can be published. This required commitment from the IPT to continue to apply resources to the effort and to be patient in getting the desired results.

Table 1. Key Elements to Be Standardized

Type	Element
TPS	Adapter Functional and Parametric Information Diagnostic Data/Services Digital Test Format Maintenance Test Data and Services Master Conformance Index Multimedia Formats Prognostic Data/Services Test Program Documentation
ATE	Data Networking Distributed Network Environment Instrument Communication Manager Instrument Drivers Test Station/Instrument Functional and Parametric Information Receiver Fixture Interface Resource Adapter Information Resource Management Services Run Time Services System Framework
UUT	Boundary-Scan Test Data Design for Testability Product Design Data UUT Device Interfaces UUT Test Requirements

Another major effort was the definition and oversight of several Small Business Innovative Research (SBIR) and Small Business Technology Transfer (STTR) projects. These projects included the development of tools that defined, supported, and utilized the open systems approach for ATSs. These efforts also helped in the evaluation and demonstration of the standards being developed, and they produced tools that complied with the standards. The projects encompassed a broad range of topics—virtual instrumentation, embedded diagnostics, test diagrams, universal switching, TPS life-cycle support, remote diagnostics, and prognostics and health management—addressing a wide array of state-of-the-art technological advances in the ATS arena and the advancement of standards.

The IPT also worked to convince industry of the value of the open systems approach to ATS. Historically, ATE and TPSs were developed by prime contractors in a stove-piped,

proprietary fashion. The challenge for the IPT was to break through this accepted process and show the benefits of standards to both government and industry. The IPT worked tirelessly to get its message across. In particular, the IPT attended each IEEE AUTOTESTCON for the past 15 years. The IEEE AUTOTESTCON is the world's only conference that focuses primarily on automated test and related technology for military, government, and aerospace applications. The IPT sponsored demonstrations involving both DoD and industry organizations, gave presentations, authored papers for the technical sessions, and showcased the status of the standards efforts and the benefits of using standards.

In addition, the IPT provided guidance to the DoD acquisition community on how to implement an open systems approach in future ATSs. In fact, that approach is being specified in DoD ATS policy to ensure the incorporation of its standards in future DoD ATS acquisitions. The IPT also supported the implementation of DoD-wide ATS policies, such as net-centric environments, by identifying existing standards and supporting the development of additional standards. Finally, the IPT worked, and continues to work, with industry in developing demonstrations of various standards to help ensure that the standards are complete, meet DoD's needs, and are fit for commercial applications.

Outcome

The maturation of several industry standards supported by the ATS Framework IPT coincided with the design and development of a new generation of ATSs across the military services. The services were able to incorporate the standards into their ATS designs, supporting greater interoperability of TPSs among the DoD ATSs, reduced cost of obsolescence, reduced logistics footprint, and improved test quality. Table 2 identifies the standards being implemented in the services' ATSs.

Further, the work of the IPT, including the marketing of the defined standards' advantages, has led to cooperation with NASA and the United Kingdom Ministry of Defense (UK MOD). During the past 5–10 years, NASA and the UK MOD have been participating in the IEEE SCC20. The IPT has been actively pursuing cooperative agreements with the UK MOD to continue the standards development efforts and to investigate standard compliant tools that could be used across DoD and the UK MOD.

Because much of what is being implemented is for new ATSs, the implementation costs are minimized. The information described in the standards would have to be included in the ATS, with or without the standards, so there is no additional cost in implementing the standards. Using standard formats provides the benefits described above, and even reduces costs to develop tools, because commercial tools that are compliant with the standards can be purchased off the shelf and leveraged across the services.

Table 2. Standards Being Implemented in DoD ATSs

Service ATS	Standards
Air Force VDATS	ANSI C CBATS (now part of VDATS) IEEE 1145-1998; IEEE 1636.1TCP/IP (Internet Architecture Board Standards 5 and 7) VPP-2, Rev. 4.2; VPP-3.2, Rev. 5; VPP-4.3, Rev. 2.2
Army AMRDEC Depot IFTE	IEEE 1445, IEEE 1636, IEEE 1636.1, IEEE 1641, IEEE 1671-1671.6 VPP-2; VPP-3.x; VPP-4.x
Army NGATS	IEEE 1636.1; IEEE 1641 Marine Corps VIPER/T ANSI ZI36.I-1993 ASME YI4.100; ASME YI4.24; ASME YI4.34M; ASME YI4.35M ASTM-03951-98 EIA/JEDEC JESD625-A IEEE 716-1989; IEEE 771-1989 Various MilStds
Navy/eCASS	IEEE 1445; IEEE 1671,.2, .4, .6; IEEE 1636; IEEE 1636.1; IEEE-488; IEEE 1588-2008 IEEE-802 LXI 1.1, 1.2, 1.3, 1.4 PXI Hardware/Software Specification TCP/IP (Internet Architecture Board Standards 5 and 7) VPP-2; VPP-3.x; VPP-4.x VXI 4.0

Notes: AMRDEC = Aviation and Missile Research, Development and Engineering Center; ANSI = American National Standards Institute; ASME = ASME International; ASTM = ASTM International; CBATS = Common Bench-top Automatic Test System; eCASS = electronic Consolidated Automated Support System; EIA = Electronic Industries Alliance; IEEE = Institute of Electrical and Electronics Engineers; IFTE = Integrated Family of Test Equipment; JEDEC = Joint Electron Device Engineering Council; NGATS = Next Generation Automatic Test System; TCP/IP = Transmission Control Protocol/Internet Protocol; VDATS = Versatile Depot Automatic Test Station; VIPER/T = Virtual Instrument Portable Equipment Repair/Tester; VPP = VXI Plug and Play.

Current Status

The IPT continues to work on developing standards for other ATS elements. The work on standards will never be completed, because, as technology evolves, the standards must also evolve to cover the new environment.

The IPT will continue to facilitate the acceptance of these standards and technologies not only in DoD applications, but in industry as well. In addition, the IPT will continue to encourage the development of new products supporting these standards that can be used across DoD. This is necessary to ensure the availability of a viable base of commercial tools to support DoD ATSs.

Challenges

The primary barriers in effecting the solution were a lack of understanding of the need for ATS standards, a lack of defined standards related to ATSs, a lack of cross-service participation in defining ATS requirements, and the use by contractors of traditional, stove-

piped approaches in ATS design. The NAVAIR team—aided by dedicated, hard work by DoD and industry representatives—successfully overcame those barriers by establishing strong partnerships among technical and managerial leads in the DoD ATS community and marketing goals and progress to industry. The team's success is evidenced by the architectures of the latest generation of DoD ATSs and by the number of commercial products that are compliant with the standards.

About the Award Winner

The NAVAIR IPT consisted of Chris Giggey, Anthony Geneva, Michael Malesich, Mukund Modi, and Jennifer Fetherman.

Chris Giggey played an important role in keeping the open systems framework in existence. He supported the continuing advancements of the IPT and encouraged NAVAIR PMA-260 to continually provide funding for government and contractor support, especially difficult during the recent years of severe resource constraints. He briefed the head of PMA-260 with summaries of the framework, including how the framework supports other programs of interest to PMA-260 and what issues needed to be addressed to help ensure a consistent approach to various ATS modernization efforts. He also plays a lead role in helping to identify and support framework efforts for the AMB.

Anthony Geneva directly supported the technical aspects of several ATS framework elements. He defined and justified the funding required to advance the development of the standards, and he helped ensure that the standards are included in eCASS, the next generation of the Consolidated Automated Support System. Mr. Geneva also worked with industry to help define and develop standards in the ATS framework.

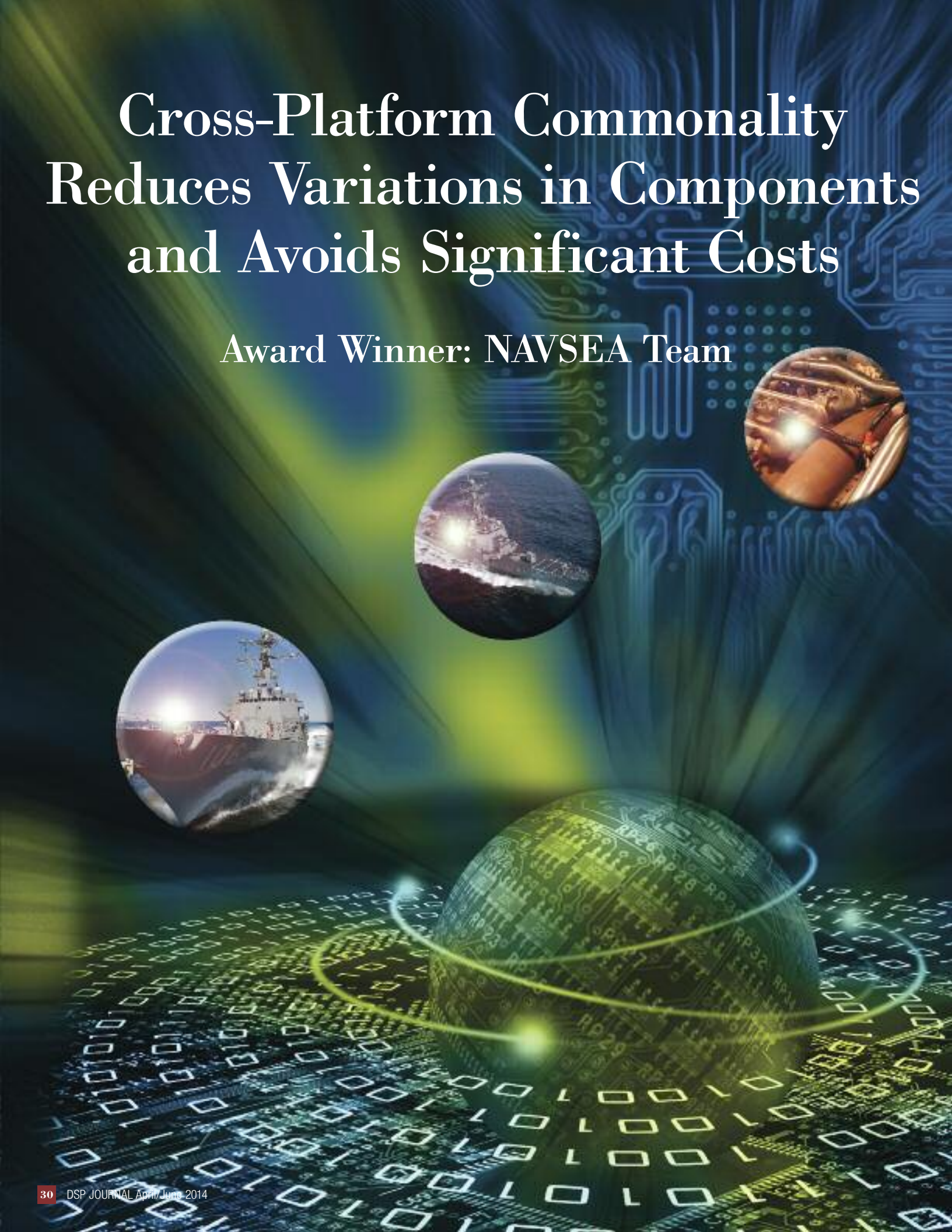
Michael Malesich, the DoD Framework IPT's lead and the technical point of contact (POC), oversaw all areas of the framework. He presented the framework status to the AMB to ensure continuing support from all of the DoD services, led various standard demonstrations, presented papers at conferences to promote the use of standards, and submitted and managed SBIR/STTR topics on standard modification or development. Mr. Malesich participated in several reviews of the eCASS requirements specification related to standards, and was heavily involved in supporting standards development.

Mukund Modi was one of the technical POCs for several of the standards that have been incorporated into DoD ATSs. He helped define and create portions of the DoD/industry demonstrations to prove that the standards are viable in the DoD and industry ATE environment. He co-authored papers presented at conferences to promote the use of standards. Mr. Modi continues to create a demonstration environment at NAVAIR Lakehurst that is being used to demonstrate the compatibility and use of standards with tools developed by DoD and industry.

Jennifer Fetherman assisted with all aspects of the framework. She participated in several reviews of the eCASS requirements specification related to framework standards. Ms. Fetherman also assisted with various SCC20 standard demonstrations, including identifying the standards to be demonstrated, gaining industry participation, and reviewing and commenting on demonstration plans. She led several efforts related to marketing the framework standards at AUTOTESTCON. In addition, she assisted in submitting numerous SBIR topics and one STTR topic. Once topics were approved, she participated in reviewing numerous proposals from small businesses and helped to manage the progress of the selected companies.

Cross-Platform Commonality Reduces Variations in Components and Avoids Significant Costs

Award Winner: NAVSEA Team



A team from the Naval Sea Systems Command's (NAVSEA's) Commonality Program identified variations, or lack of standardization, in systems as a cost driver in the acquisition and maintenance of the fleet. The goal of the NAVSEA Commonality Program is to reduce those variations, using cross-platform requirements and total ownership cost (TOC) as the basis for the reductions. The Commonality Program team has focused on hull, mechanical, and electrical (HM&E) systems, identifying 32 specific HM&E areas in which variations could be reduced by as much as 95 percent. Reducing the variations can provide significant cost reduction opportunities for programs to meet their should-cost goals. The Commonality Program team also worked to identify the cost drivers in specifications and standards. To date, the team has identified 23 specifications as having cost drivers exceeding $5.4 billion (over 30 years). NAVSEA's investments in the Commonality Program have provided the Navy with a return on investment (ROI) of approximately 170 to 1. Not factored into the ROI are additional cost savings related to item reductions, commodity contracting, and elimination of inventory; training; and other logistics issues.

Background

The U.S. Navy acquires and maintains multiple classes of ships. Each ship carries out critical mission requirements in support of national interests throughout the world. These ships have common inherent functions to ensure mission capabilities are accomplished. Program Executive Office (PEO) program managers (PMs) are responsible for the acquisition of these ships, including their systems, subsystems, and components. The systems, subsystems, and components are procured using performance specifications. The use of performance specifications resulted in the procurement of systems, subsystems, and components that accomplished the functions, but supported increased variation across classes of ships as well as within ship classes. An analysis of one ship class identified 15 different machinery control systems (MSCs) with various human-machine interfaces, multiple operating systems, and 94 unique VME cards. Each MSC required different training and logistics support. Additional analyses identified more than 7,000 different pumps, 47,000 different valves, and 4,000 different motors supporting functions within the fleet. This variation was determined to increase the acquisition and life-cycle cost of Navy ships, which, in turn, affects the affordability of the ships.

Problem/Opportunity

Variations of systems are contributing to the increasing acquisition and life-cycle cost of the fleet. These increasing costs contribute to the decrease in the number of ships the Navy can procure and sustain. In an August 1, 2013, letter, Commander, Fleet Forces Command, stated that "variance causes inefficiencies in maintenance, logistics and per-

sonnel distribution. The current level of variation in surface ships is unsustainable and must be reduced to a manageable level."

NAVSEA created the Commonality Program to address the problem of excessive variation within the fleet, specifically, to reduce variation on the basis of cross-platform technical requirements, reduce TOC, and define an eliminated cost in specifications and standards. One example that defines the opportunities for variation reduction and cost avoidance/savings is related to fasteners. In its review of fasteners, the Commonality Program team identified 108,000 dormant national stock numbers (NSNs) and 3,200 duplicate NSNs. In a 1999 report, the Defense Logistics Agency (DLA) estimated that maintaining an NSN costs $200 to $500 per year. The team's efforts allowed the supply system to eliminate and consolidate the NSNs. In an analysis of one Monel fastener, the team determined that, by eliminating duplicate NSNs and consolidating the purchase under one NSN, the cost would be reduced by 37 percent.

Approach

The Commonality Program team's approach to variation reduction studies focused on applying a best practice commonality construct that it validated via private-sector applications and then tailored to meet the Navy's needs. Using Navy databases, and working with the technical authority, the team established cross-platform requirements for more than 50 major functional systems. The analysis of the cross-platform requirements, coupled with reliability and TOC analysis, formed the basis for selecting the reduction in variants for new acquisition and sustainment programs. The team also focused on defining cost drivers in specifications, consolidating specifications, and defining the application of commercial specifications in place of military specifications. The analysis aligned with standardization efforts to eliminate excessive variation from the supply system.

Outcome

The Commonality Program team identified opportunities to reduce variations in 32 specific HM&E areas by up to 95 percent. Eliminating those variations can provide significant cost avoidance opportunities, enabling programs to meet their should-cost goals.

The team also has identified 23 specifications and standards contributing to excessive costs and has defined modifications to those specifications and standards that, when updated and applied, will support cost reductions of more than $5.4 billion over 30 years. These specifications and standards are being modified and applied to various acquisition and modernization programs.

Commonality also provides opportunities to reduce the logistics train through supporting commodity contracts and item reduction studies to further reduce supply chain costs.

NAVSEA investments have provided the Navy with an ROI of approximately 170 to 1. Not factored into the ROI are additional cost savings related to item reductions, commodity contracting, and elimination of inventory; training; and other logistics issues. The cost reductions in these areas could further increase the ROI and reduce the payback period.

The team also established a "virtual shelf" of items, making it available to the Navy, its shipyards, and shipbuilders. The virtual shelf contains defined systems, components, specifications, and standards that can be applied to ship design, acquisition, and sustainment efforts to provide the optimal performance at the lowest TOC.

Current Status

The Commonality Program team completed the variation reduction studies in FY13. In parallel with those studies, the team has been updating specifications and standards. Updating the virtual shelf with the most capable and affordable systems, subsystems, and components will continue. Each shelf item will be reviewed every 6 to 18 months, depending on its technology life cycle. In the review, the team will determine, on the basis of performance and cost, if new technology should be integrated into the shelf by replacing older items.

NAVSEA's investments in the Commonality Program have provided the Navy with an ROI of approximately 170 to 1. Not factored into the ROI are additional cost savings related to item reductions, commodity contracting, and elimination of inventory; training; and other logistics issues.

Commonality results have been, or will be, implemented on DDG-51 FLT II and III, CVN 79, CVN RCOH, LHA8, and other ship classes in design and modernization. Implementation will be a continuous process. Results will be applied as ship designs mature and modernization programs progress with the application of the virtual shelf in commonality.

Challenges

During the development of the commonality construct, the team overcame multiple financial, technical, and cultural barriers to implementing the solutions defined.

FINANCIAL BARRIERS

The team developed the commonality construct as a series of pilot efforts to demonstrate the applicability of the approach to Navy systems, subsystems, and components. On the basis of the initial results, the team implemented a strategy to accomplish 12 variation reduction studies per year for 3 years. The cost to accomplish these studies was estimated to be $8 million per year. Obtaining funding for the 12 studies per year required the support and acceptance of a diverse set of senior leaders within NAVSEA, the PEOs, and the warfare centers.

TECHNICAL BARRIERS

NAVSEA technical authority is based on the expertise of the Technical Warrant Holder (TWH) in each particular area. The TWHs are responsible for their systems across the fleet and must respond to any issue related to a fleet technical area. Because of its focus on reducing variations in particular technical areas, the Commonality Program team required the support of the TWHs. The team implemented strategies to ensure that the TWHs reviewed and supported the approach and results being developed, while also accounting for the time constraints of the TWHs. This approach not only assisted the TWHs in overcoming time constraints, but also gained significant buy-in from the TWHs.

CULTURAL BARRIERS

The implementation of commonality principles requires a significant cultural change in NAVSEA and the PEOs. The approach developed by the Commonality Program team provides ship design managers (SDMs) and ship acquisition PMs a simplified way and a ready reference to select systems for ship designs and acquisition. However, achieving the goal of commonality was perceived as interfering with the SDM and PM functions by defining what systems they should select rather than letting them select the systems for the design. Addressing this issue required senior leadership support, but more important, direct and continual contact with the SDMs and PMs for each ship being designed and slated for modernization. The team developed SDM/PM handbooks outlining the benefits of commonality. The team also developed commonality ship class implementation packages so that the SDMs and PMs could understand which commonality results apply to their ship class, when commonality could be applied, and how much the implementation could cut their costs. In addition, NAVSEA's lead contracting organization developed commonality contracting clauses. Together, these efforts resulted in multiple virtual shelf items and agreements by the SDMs and PMs to apply virtual shelf specifications and standards.

About the Award Winner

The NAVSEA Commonality Program team consisted of John Sofia, William Moss, Tyrone Smith, Tessa Kashuba, and Dana Melvin.

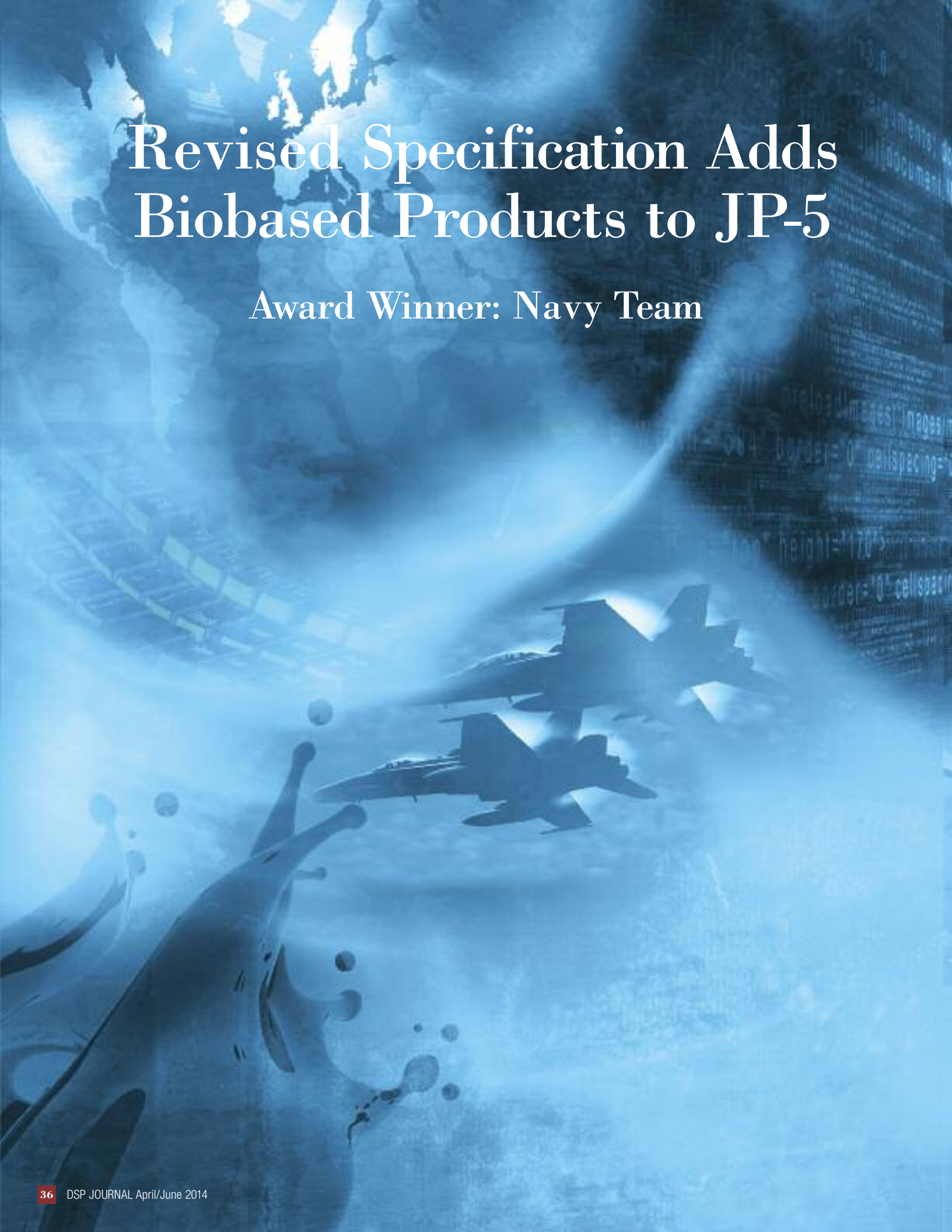
John Sofia, director of the NAVSEA Commonality Program since its inception in 2008, developed and implemented the program and strategy to conduct variation reduction studies and eliminate cost drivers in specifications and standards. He developed the governance strategy across NAVSEA and its affiliated PEOs to implement the results with new acquisition and sustainment programs. He aligned the commonality effort to take a systems-level approach across the Navy supply chain, rather than just the engineering aspects of variation reduction, by working closely with the Naval Supply Systems Command, DLA, shipbuilders, and shipyards. He also was instrumental in establishing the virtual shelf.

William Moss, the program's deputy director, focused on the implementation and execution of the Commonality Program by the warfare centers and the in-service engineers. He was responsible for executing the commonality process, updating specifications, and certifying the accuracy of the virtual shelf items. He led the implementation efforts and provided the stewardship of the commonality effort at the warfare centers, and he championed the interface between the engineering and logistics communities to foster the systems-level approach to commonality.

Tyrone Smith focused on the implementation of the commonality results across platforms. He led the effort to interface with the PEOs and NAVSEA's two warfare centers to drive commonality implementation and to create culture change across the NAVSEA enterprise, as well as across the research and systems engineering competency. Mr. Smith also led the interface with the SDMs to implement commonality results so that acquisition programs can benefit from the reduction in variations and from the reduced-cost specifications and standards. Through his efforts, commonality results have been implemented across several ship classes.

Tessa Kashuba led the analysis of deep-dive results as related to the logistics implications of commonality. She also led the efforts to eliminate and consolidate duplicate NSNs and interfaced with several in-service program offices to encourage commonality implementation for modernization programs.

Dana Melvin led the efforts to integrate commonality in multiple acquisition programs. His efforts resulted in the implementation of multiple specifications and parts from the virtual shelf.



Revised Specification Adds Biobased Products to JP-5

Award Winner: Navy Team

A Navy team—consisting of people from the Propulsion and Power Engineering Department and the Systems Standardization Division, components of the Naval Air Systems Command's (NAVAIR's) Naval Air Warfare Center Aircraft Division (NAWCAD)—revised MIL-DTL-5624, "Turbine Fuel, Aviation, Grades JP-4 and JP-5," to allow the inclusion of advanced biobased components in JP-5. The revised version of the specification, MIL-DTL-5624V, facilitates the production of JP-5 aviation turbine fuel containing blends of synthesized paraffinic kerosene (SPK) components derived from the Fischer-Tropsch (FT) process or from hydroprocessed esters and fatty acids (HEFA). Compared with commercial aviation turbine fuels, JP-5, a military-unique fuel, is required to have a substantially higher flash point for shipboard safety. Safety is of utmost importance, because JP-5 is stored in large quantities on carriers and other vessels where the risk of fire is great. The capability to fuel its various aircraft with biofuel blends supports the Navy's quest to gain energy independence.

Background

The Navy has undertaken an alternative sources initiative to comply with the Secretary of the Navy's energy goals; the Farm Security and Rural Investment Act of 2002 (Public Law 107-171); and the Food, Conservation, and Energy Act of 2008 (Public Law 110-234). One specific goal of the initiative is to revise military specifications that will fulfill regulations for procurement and usage of biobased products, that is, products that are composed in whole, or in significant part, of biological products, renewable agricultural materials (plant, animal, or marine), or forestry materials. The Navy's goal is to reduce its consumption of energy, decrease its reliance on foreign sources of oil, and significantly increase its use of alternative energy and reduce the impact of military operations on the environment.

Problem/Opportunity

JP-5 is a kerosene-based fuel developed for use in aircraft stationed aboard ships. JP-5 comprises a complex mixture of hydrocarbons containing alkanes, naphthenes, and aromatic hydrocarbons and has a high flash point. It has traditionally been produced by refining petroleum crude oil. JP-5 requires military-unique additives that are necessary in military weapon systems and engines. The NAWCAD team identified the opportunity to integrate or blend the fuel's petroleum-derived components with biobased components and still meet the performance, operational, and safety requirements of Navy and Marine Corps aircraft as well as the requirements of naval shipboard fuel-handling and power-generation systems.

Approach

This standardization action required updating the specification requirements and test methods to allow the new biobased components in JP-5. The team members from the Naval Fuels and Lubricants Cross-Functional Team—the subject matter experts (SMEs) for the development, modification, and testing of requirements in MIL-DTL-5624—worked with SMEs from NAVAIR, DoD, and industry to acquire, test, and certify JP-5 containing FT and HEFA components for use in Navy and Marine Corps weapons systems. The team then determined the new requirements and test methods that needed to be added to the specification. The HEFA process is a technology that converts vegetable oils and animal fats from triglycerides into hydrocarbons suitable for use in diesel and jet fuels. Producing fuels from these alternate sources (other than petroleum) offers the potential to diversify domestic energy supplies while mitigating the environmental impacts of aviation, specifically by reducing carbon dioxide emissions into the atmosphere.

The team members from the Systems Standardization Division focused on the maintenance, revision, and publication of the document. They worked through an extensive coordination process, adjudicated comments, and refined the specification requirements to ensure compliance with DoD standardization policies.

Outcome

As a result of the team's work, MIL-DTL-5624 now includes JP-5 consisting of SPK-blend components. The capability to fuel its various aircraft with biofuel blends supports the Navy's quest to gain energy independence. Publication of MIL-DTL-5624V provides the military services with the option of using biofuels. Having biofuels available will enable DoD to diversify away from fossil fuels created from foreign energy sources, which produce significant carbon emissions when burned, to biofuels that can be produced domestically and used with minimal environmental impact.

Current Status

MIL-DTL-5624V was published in July 2013. It resides in the Defense Logistics Agency's ASSIST database and is available to the public. The fuel is certified and currently being used in naval aircraft.

Challenges

Certification through testing of the biobased fuels was required to ensure the specification's requirements would produce a fuel that is compatible with Navy, Army, and Air Force platforms, as well as with land- and sea-based storage and distribution systems.

Another challenge was addressing Naval Sea Systems Command issues, because JP-5 is used for emergency diesel generators on nuclear-powered aircraft carriers, which have a reactor safety factor.

About the Award Winner

The Navy team consisted of five people from NAVAIR's NAWCAD. Douglas Mearns, Richard Kamin, and Ryan Turgeon are members of the Navy Fuels and Lubricants Cross-Functional Team and work in the Propulsion and Power Engineering Department, while Carl Levandusky and Rose Webster work in the Systems Standardization Division.

Douglas Mearns is a systems engineer and the technical warrant holder for the fuels and lubricants used in naval aviation. He was responsible for certifying that the new fuel components could be used safely and effectively in naval aircraft.

Richard Kamin, a chemical engineer and the Navy's fuel team lead, managed and led the Navy's extensive efforts to acquire, test, and certify biobased components in JP-5. Ryan Turgeon, a fuels chemist, led the team in determining, developing, and modifying NAVAIR/DoD technical requirements and test methods for the revised specification.

Carl Levandusky is a general engineer. He managed the standardization activities, tracking, coordinating, and ensuring compliance to standardization policies and procedures. He resolved document and standardization issues between the SMEs, document reviewers, and the technical editor.

Rose Webster, the technical editor, reviewed the document for conformance to DoD policy, specifically, DoD 4120.24M, *Defense Standardization Program (DSP) Policies and Procedures*, and MIL-STD-961, "Defense and Program-Unique Specifications Format and Content." She coordinated the final effort with the Defense Automation and Production Service and prepared the document for final publication.

Converting to Commercial Jet Fuel Saves Millions of Dollars

Award Winner: Air Force Team

The Air Force Petroleum Agency, recognizing the significant cost savings it would realize if it used fungible, commercially available Jet A fuel instead of MilSpec JP-8 jet fuel, formed a team to take the steps necessary to make the conversion to the commercial fuel. The Jet A team designed the program to leverage the capabilities of CONUS commercial jet fuel supply chains to increase Air Force operational efficiencies while eliminating unnecessary infrastructure and the associated maintenance and sustainment processes. Converting to a widely used commercial fuel has several benefits. It enables DoD logistics buyers to exploit competitive sourcing, ensuring the government obtains the best value in today's fiscally constrained environment. It increases the agility of the military services and the Defense Logistics Agency (DLA) in their efforts to meet the requirements of the warfighter. And it has the potential to yield multimillion-dollar annual savings.

Background

In 2009, DoD consumed just over 2.1 billion gallons of jet fuel domestically, while commercial airliners consumed more than 17 billion gallons. The capacity of the commercial fuel infrastructure to support commercial fuel products is over eight times the capacity of the military jet fuel infrastructure supporting DoD mission requirements. When only single sources of MilSpec supply were available for procurements in some areas, DLA procurement agencies struggled to meet wartime requirements. A series of supplemental solicitations were required, because petroleum refineries were hesitant to use limited storage infrastructure to stock a specialized product.

MilSpec JP-8 jet fuel and commercial jet fuels are similar, with the main difference being the specification fuel freezing points. MilSpec JP-8 has a colder maximum specification freezing point of −47° C, whereas the Jet A specification is −40° C maximum. The JP-8 MilSpec also mandates three fuel additives: fuel system icing inhibitor, static dissipater additive, and a corrosion inhibitor/lubricity improver. The commercial Jet A standard categorizes these same three additives as optional. Because of the fuel freezing point and additive differences, the two fuels require segregated supply chain handling and dedicated storage.

Problem/Opportunity

The current JP-8 fuel supply chain operation utilizes cross-country pipelines to deliver jet fuel to Defense Fuel Supply Points (DFSPs). This requires scheduling the transport of batches of MilSpec fuel within the same pipelines used to transport commercial-grade jet fuel. Break-out storage tanks and other infrastructure were required to remove the mix of commercial and MilSpec fuel in the pipeline before the MilSpec jet fuel was inducted into base inventory. Furthermore, proper disposal of the mix of commercial and MilSpec fuel had an additional cost.

In addition, ordering and handling specialized MilSpec fuel not only limits the list of suppliers capable of production, it allows suppliers with those capabilities to set higher prices for both the product and services—a typical supply and demand scenario. Suppliers using cross-country pipelines for modal delivery were hesitant to provide the required amount of JP-8 because of the requirement to segregate the fuel and the associated costs of moving specialized fuel in a fungible transportation system.

By converting the CONUS fleet to commercial-grade jet fuel, DLA will have more refineries for consideration in the competitive sourcing process, which will lower the price of fuel. The conversion will allow DLA to take full advantage of the fungible nature of cross-country pipelines. By strategically placing injection systems at DFSPs, DLA Energy will be able to limit the number of required systems. In addition, DLA will be able to eliminate some infrastructure within its supply chain system and will avoid having to fund sustainment and modernization projects, which also eliminates the need for Future Years Defense Program funding. The conversion will eliminate the need to segregate product in the commercial infrastructure used in the DLA supply chain, which will lead to transportation cost savings. By gaining easier access to commercial product, the Air Force will have opportunities to reduce operational stocks in some locations without adversely affecting the warfighter mission. Furthermore, the alignment with commercial specification jet fuel will allow DoD to take advantage of an agreement with DLA and Airlines for America (formerly, the Air Transport Association, Inc.) to foster the growth of alternative aviation fuel production on a commercial scale.

Approach

The Jet A team started the conversion process with testing at several Air Force locations and then with testing at strategic locations in the regional supply chains. In less than 5 years, the program has been successful to the point of planning for full DoD-wide conversion of CONUS. The Jet A team facilitated this effort through the use of open communications and 100 percent transparency between DLA, the service control points, and the individual military service customers. By examining inventories, weapon systems, local fuel availability, and procurement cycles, the team addressed the wholesale conversion of DoD's "single fuel on the battlefield" (JP-8) to the satisfaction of all involved parties. Meticulous coordination was required to ensure our NATO partners, both abroad and those who are CONUS tenants, were able to properly address acceptance of the conversion and promulgate necessary standardization agreements and regulations. The Jet A team also coordinated with the Environmental Protection Agency at the federal level to update DoD's national security exemption for the use of jet fuel in tactical deployable vehicles and equipment; the team also coordinated with environmental programs at the state and local levels to ensure all environmental permits were updated to accurately reflect the product change.

Expert supply chain analysis was required to identify the optimal locations for injecting the three service-required additives while balancing the management of stock without the additives in order to receive the fungible benefits. Through outstanding cooperative efforts, injection locations were quickly identified and agreed upon, taking into account the various impacts on the supply competition, so the necessary infrastructure upgrades to support the injection of additives at the DFSPs could begin.

Furthermore, the team's efforts in the Jet A Conversion Working Group (JACWG), serving as the official communications link between DLA Energy and the service control points, were key to resolving operational constraints, documenting agreements, and establishing a symbiotic relationship that benefitted both DoD and the suppliers. The end results of the Jet A team's efforts were immediate cost savings and secured coverage of operational requirements with minimal transitional impact on the end user.

Outcome

Since June 2011, more than 1.3 billion gallons of Jet A have been sold at Air Force locations at a cost savings of $13 million. Those savings have been realized with only 50 percent of the Air Force's locations converted. The Jet A team's efforts have ensured that DoD leaders and our internal partners see the merit and tangible benefit of converting to commercial-grade product. Conversion to a fungible commercial jet fuel has removed the necessity for additional infrastructure, as well as eliminated the repair/sustainment cost from current facilities, potentially saving millions of dollars. DLA was able to meet DoD peace and wartime requirements without supplemental solicitations.

Current Status

Full CONUS conversion will be realized by early FY15, with the specific timetable dependent on the procurement award cycle. Locations that experience inclement weather will also drive schedule exceptions.

Challenges

Communication to all involved parties required special attention. Sharing of key information, both research and decisional, was required to ensure that concerns were outlined and answered. The Jet A team members' background (scientific, technical, protocol, operational, managerial, international relations, and so on) and their experience added foresight into multiple processes that aided in the transition. Considerable effort to enlist equipment and weapon system owners in the task of updating technical data and manuals was required, because the team goal was to ensure that all applicable material for DoD and partnering countries was properly addressed.

About the Award Winner

The Air Force team consisted of MSgt Bradley West, SMSgt Gregory Carrow, Tracy Edmonds, Gordon Walker, and Cheryl McCormick.

MSgt Bradley West, Jet A program manager since 2013, managed the conversion of individual sites from JP-8 to commercial Jet A, establishing inventory stock requirements, coordinating travel, staffing official correspondence, and providing data for analysis, including media packages. MSgt West finalized the U.S. Air Force Program Guidance Letter, signed by the Secretary of the Air Force and the Air Force Chief of Staff, which provided authority and guidance to convert the CONUS Air Force locations to commercial jet fuel. He is the acting Air Force lead for the JACWG that coordinated full CONUS conversion in conjunction with the other service control points. He also secured $300,000 for the purchase and distribution of centralized fuel product identification decals/markings, eliminating the need for individual units to re-mark their fuel-dispensing equipment and facilities from JP-8 to Jet A.

SMSgt Gregory Carrow, 2011–13 Jet A program manager, led the acquisition of fuel freezing point analyzers and organized their placement at strategic locations in the supply chains, enabling base fuels offices to provide the Tanker Airlift Control Center actual fuel freezing points versus the specification limit, if needed. The actual freeze point readings allow flight planners to develop specific operational flight windows. In addition, having those data alleviates operational concerns about the difference in freezing points to various weapons system owners; their coordination reduced the time and effort required to update technical manuals. SMSgt Carrow coordinated the setup and removal of innovative additive injectors at no additional cost to the Air Force. His efforts demonstrated that commercial technology would help DLA and DoD take advantage of strategic injection points.

Tracy Edmonds, DLA's liaison to the Air Force service control point representative, provided vital fuel inventory requirements and sales data, which were paramount to creating strategic conversion plans and analyzing supply chains. Her efforts in retrieving accounting and inventory information from multiple Air Force and DLA Energy databases and consolidating it into usable decision-quality data assisted not only the Air Force, but the Army and Navy as well. Providing query responses in multiple formats proved instrumental to the JACWG's planning/execution efforts, ultimately allowing DLA Energy to move forward with contracting action.

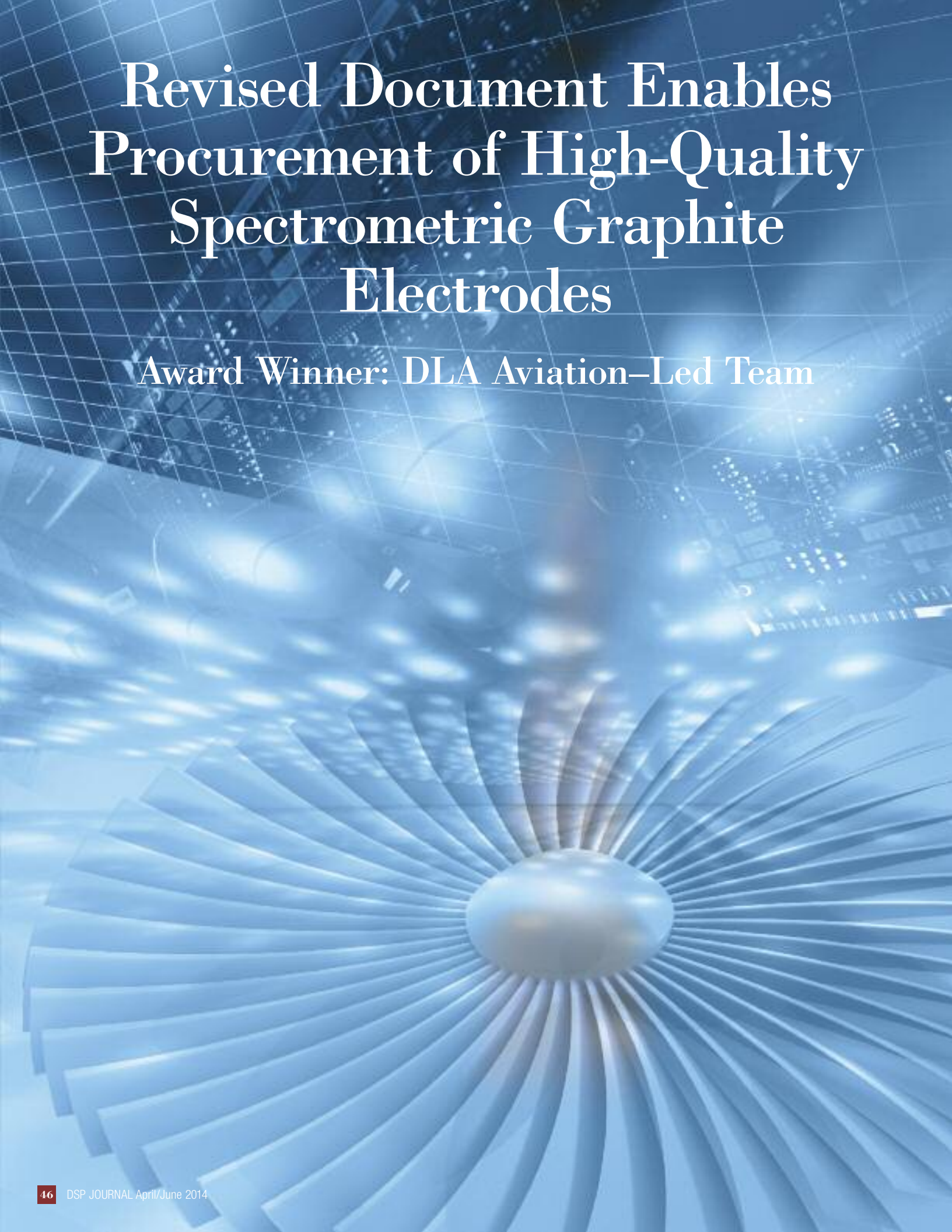
Gordon Walker, chief of the Technical Assistance Division, provided technical guidance and direction as the quality operations were translated from MilSpec to commercial-grade jet fuel. His overarching support led to the coordination and updating of MIL-STD-3004, "Quality Assurance/Surveillance for Fuels, Lubricants and Related Products," to ensure that fuel quality assurance procedures were transparent and interchangeable within the services. Mr. Walker was one of the initial leads who planned the additive injection demonstration project, allowing the Air Force to assess cost-saving commercial off-the-shelf technology. His office has been the focal point to ensure the provision of quality and technical support to units converting infrastructure and procedures to the new standard military use of commercial Jet A with additives.

Cheryl McCormick, a chemist from the Science and Technology Division, coordinated the collection and dissemination of several key foundational research reports instrumental in obtaining approval from the Air Force weapon system program offices for the use of Jet A with additives through the

Air Force Materiel Command's Operational Safety Suitability and Effectiveness process. Ms. McCormick was critical in communicating the CONUS conversion plan to our allies and was instrumental in obtaining agreement within NATO to establish a NATO standardization code for commercial Jet A with additives (NATO code F-24). This agreement was essential to ensure NATO ratified the use of CONUS Jet A fuel for use in NATO-country aircraft. She also established herself as an Air Force expert within commercial forums, such as ASTM International and the Coordinating Research Council. Having a position within these forums was critical in ensuring that Air Force and DoD requirements were recognized and represented with regard to moving to full-time use of a commercial jet fuel specification. Ms. McCormick provided focused and relevant data to leadership of all involved communities.

Revised Document Enables Procurement of High-Quality Spectrometric Graphite Electrodes

Award Winner: DLA Aviation–Led Team



A team led by the Standardization Program Branch from the Engineering and Technology Division, Defense Logistics Agency (DLA) Aviation, revised MIL-DTL-8971, "Electrodes, Graphite, Spectrometric Grade." Graphite electrodes are used by all of the services for wear-metal analysis of engine oil. Analyzing wear-metals and their concentration is critically important for identifying engine components that are degrading and require maintenance and for preventing engine failures. The standard needed to be revised because the electrodes being produced by the manufacturers were failing qualification and conformance testing. Furthermore, the manufacturers were unable to provide the data needed for the flexural strength testing required in MIL-DTL-8971. As a consequence, the graphite electrodes were unprocurable, which resulted in substantial back orders and, with the lack of electrodes, increased safety risk. The team, consisting of Standardization Program Branch personnel plus two engineers from the Army, coordinated closely with the military services on the technical requirements of MIL-DTL-8971 and discussed the altered technical requirements with the manufacturers. The team published the revised MIL-DTL-8971 in September 2013, ensuring the timely procurement of high-quality graphite electrodes.

Background

When an engine component begins to wear, particles from that component will leach and dissolve in the engine oil. A worn engine component can cause engine failure and put service members at risk. To determine if engine components are degrading, the military services use spectrometric-grade graphite electrodes, which consist of a rod and a disk. The rod works with a high-energy arc to produce a light pattern read by a photometric analyzer, and the disk feeds oil into the arc. These electrodes enable the services to identify the type and concentration of wear-metals, such as copper or iron, in engine oils. Because each engine component is traceable based on the metal from which it is made, the services can use the results of the wear-metal analysis to determine if any component is degrading and to take steps to preclude a malfunction before a failure event.

Because spectrometric-grade graphite electrodes are critical to safety, DLA procures them from manufacturers on the qualified products list (QPL). Historically, only two manufacturers have been on the QPL for these electrodes. Having only two qualified sources of supply was adequate for DLA procurement; however, both manufacturers began to experience quality issues with their products at about the same time, regularly failing the accuracy and repeatability tests required for ensuring qualification and conformance.

The manufacturers are required to submit sample electrodes to the Joint Oil Analysis Program (JOAP) laboratory for accuracy and repeatability testing to determine the effectiveness, or quality, of the electrodes. The accuracy test determines whether the elec-

trodes are reading the proper values when compared against a known standard. For example, if the electrode is supposed to be reading 30 ppm of dissolved copper, the accuracy test will determine how close the electrode is to that number. The repeatability test determines whether the batch of electrodes will give the same number over a repeated number of tests. For example, repeatability determines if a manufacturing lot of electrodes will each read 30 ppm of dissolved copper. These tests are invaluable in giving the services the information needed to make decisions about engine maintenance.

Not only were both manufacturers' electrodes regularly failing the JOAP accuracy and repeatability tests, but neither manufacturer was reporting test data for the flexural strength testing required in MIL-DTL-8971. The flexural strength test uses a specific apparatus, which was called out in the standard. The manufacturers claimed they did not have access to the testing apparatus. This caused serious difficulties, because the flexural strength test was required for qualification inspection, as well as for retention of qualification.

These issues, which precluded procurement, persisted for more than 2 years. Meanwhile, procurement back orders were stacking up, and the services were not receiving the electrodes needed to test for wear-metals. As a temporary solution, DLA issued a 1-year waiver. However, DLA and the military services did not have confidence that the quality of the electrodes procured under the waiver was sufficient to meet the qualification criteria.

Problem/Opportunity

DLA Aviation's Standardization Program Branch, the preparing activity (PA) for MIL-DTL-8971, recognized that the waiver was not a long-term solution for the timely procurement of high-quality spectrometric-grade graphite electrodes. Therefore, the branch undertook the task of developing a solution addressing the root cause of the testing issues and ensuring that the manufacturers could meet the services' requirements for effective electrodes. An effective solution would, in turn, enable the military services to obtain the electrodes within a reasonable time frame.

Approach

The Standardization Program Branch quickly realized that the task involved more than simply solving the issues with the accuracy and repeatability tests and the flexural strength test. The task also required revising all of the MIL-DTL-8971 criteria to ensure a high-quality product that meets the technical requirements of the military services, the primary users of the electrodes, while also considering manufacturing capabilities.

MIL-DTL-8971's technical requirements included items such as mass and density, geometry and dimensions, resistivity, flexural strength, material impurities and raw-stock

graphite grade, and accuracy and repeatability. To develop the requirements, the team decided to begin by validating the requirements in existing versions of MIL-DTL-8971, primarily, the two most recent versions, revision D and revision E. The team did this through group discussions involving the branch, the military services, and the manufacturers. The group considered each technical requirement, one by one, addressing whether it was still applicable, whether it was achievable by the manufacturer, and what level of quality it would bring to the end product. On the basis of the discussion, the group decided if a technical requirement would be left as is, eliminated, or updated.

The mass and density requirements were fairly simple for the group to assess. These two requirements, which came from MIL-DTL-8971E, had no history of causing problems, so the group decided to leave them as is.

The electrodes' rod and disk geometry and dimensions were derived from MIL-DTL-8971E, but the group changed the rod length tolerance from 6.00–6.25 inches long to 5.90–6.25 inches long. The rods are sharpened and subsequently shortened after each use until they are too short. Therefore, allowing for a looser tolerance on the length will not play a role in the quality of the product, but will allow for easier manufacturing.

The group kept the same resistivity requirements; however, it altered the testing fixture. The resistivity testing fixture from previous revisions had such strict requirements that manufacturers were having a difficult time accomplishing the tests. The group determined that such strict requirements were not necessary, because the calculation for resistivity takes dimensions into consideration. The diagrams for the fixture from previous revisions called for 2.5 inches between contacts, but this could actually be any length because the resistivity calculation has a length factor. Therefore, the group changed the 2.5-inch dimension to simply "L."

Flexural strength was an issue similar to resistivity, but the group took a somewhat different approach. Like resistivity testing, flexural strength testing requires a fixture, which the manufacturers were having difficulty acquiring. The group could not address the problem by simply generalizing the dimensions, as it did for the resistivity fixture. Instead, the group had to define the fixture that could be used for flexural strength testing. Specifically, to ensure both quality and testability, the group identified three options: the flexural strength testing fixture called out in MIL-DTL-8971D, the fixture called out in MIL-DTL-8971E, or a fixture suggested by the manufacturers and approved by the branch.

The material impurities requirements restrict the type and the amount of contaminant elements within the graphite of the electrodes. Because this primarily concerns the quality of the raw graphite, rather than the electrode functionality, the group decided that the

manufacturers could select the means of determining conformance. However, the manufacturers are required to provide written certification that the end product conforms to the impurity requirements, as well as provide written procedures on how their tests are performed.

Regarding revisions to materials impurities testing, the group had to decide which types and what concentrations of contaminants should be addressed in the revision. The group removed four elements from material impurities testing: barium, cadmium, manganese, and vanadium. The military services neither have the ability to test for these materials in the field, nor do they have a need to test for them. In addition, the group decided to use the concentration allowance from MIL-DTL-8971E. The graphite may have only 1 ppm for a single element and up to 6 ppm for all elements, allowances that the manufacturers are currently meeting.

The final requirement considered by the group was accuracy and repeatability testing, which is designed to confirm that the electrodes are correctly identifying the elements present in oil, as well as correctly analyzing the concentration of those elements in the oil.

The final requirement considered by the group was accuracy and repeatability testing, which is designed to confirm that the electrodes are correctly identifying the elements present in oil, as well as correctly analyzing the concentration of those elements in the oil. The group understood that the JOAP testing procedures would remain the same. Therefore, the most important aspect of the requirement was to ensure that accuracy and repeatability testing covered all appropriate elements. Once again, because the military services have neither the ability nor the need to test for the four elements removed from the materials impurities testing, the group also removed them from the accuracy and repeatability testing.

Once they developed a list of requirements, the branch and the military services coordinated with the manufacturers to ensure the new requirements could be met and to get input from technical experts producing these products daily. The team then incorporated all of the technical requirements into the document and oversaw the approval coordination phase.

Outcome

The Standardization Program Branch published the revised version of MIL-DTL-8971—revision F—in September 2013. Because the requirements in MIL-DTL-8971F are tailored to ensure the manufacture of a quality product meeting the needs of the military services, accuracy and repeatability failures have been essentially eliminated. The manufacturers are now producing electrodes that have the qualities necessary to pass all requirements of the standard, providing DLA a long-term solution to procuring electrodes for the military services. Most important, the military services now have confidence in a product they use for analyzing wear-metals in engine oil and for making maintenance and repair decisions to avoid engine failures. Because the military services can trust the results of their wear-metals analyses, they can make informed decisions on how to handle engine components. More than 900 field spectrometers are in use all over the world.

Current Status

MIL-DTL-8971F will soon be available on ASSIST and will be the procurement document for graphite electrodes used in wear-metal analysis.

Challenges

The team faced two primary barriers: a time barrier and a technical barrier. Time was a barrier because the branch and the military services needed to develop a permanent solution to the electrode procurement issue in just under a year, the length of time in which the waiver was in effect. This was problematic, because the team needed to coordinate with the manufacturers, research new technical requirements, and ensure the military services would receive the product they needed.

The technical barrier concerned reaching consensus on the technical requirements that should go into the new revision. Each requirement from previous revisions was discussed with the military services and manufacturers to determine both its function and necessity. Some of these requirements, such as flexural strength and resistivity, had to be researched extensively to determine their true function in the standard. The flexural strength requirement, for example, caused significant debate. The manufacturers stated they could not find the testing apparatus called out in the standard. The branch and the military services had to develop an achievable requirement for the manufacturers as well as determine the flexural strength of the requirement.

Ultimately, the team was able to work past the barriers to produce a new revision for MIL-DTL-8971.

About the Award Winner

The team consisted of Travis Wood, Dominique Stutts, Butch Bendl, and Miguel Lopez, all from DLA Aviation, and Crystal Klemmer and Michael Drylie from the Army.

Travis Wood and Dominique Stutts, PAs for MIL-DTL-8971, focused on the quality of the electrodes. Mr. Wood participated in the initial investigations of the two manufacturers after their electrodes began to repeatedly fail qualification testing. Because he was the initial PA for MIL-DTL-8971, Mr. Wood was essential to the team's understanding of which proposed technical requirements would or would not be a solution based on historical events with MIL-DTL-8971.

Dominique Stutts, the subsequent PA for the standard, brought her extensive chemical background and experience working with chemical analysis instrumentation to the team. Ms. Stutts was involved with making technical decisions, as well as coordinating with the military services to determine which technical requirements would be in the new revision. In addition, she conducted extensive research to determine the function of each technical requirement and to find sources for the test equipment. Once Ms. Stutts received the final technical requirements, she wrote the new revision and coordinated it with everyone involved in the technical decision process.

Butch Bendl was the lead standardization activity for the document. Because Mr. Bendl had worked on similar projects throughout his career, he was able to aid the branch on how to approach this project, identifying the steps required to produce a successful document. In addition, he oversaw the entire coordination effort through publication.

Miguel Lopez, the Standardization Program Branch supervisor, oversaw each step of the process. He participated in many of the meetings to discuss technical requirements and was the point of contact in determining the branch's capabilities. When new standardization requirements were proposed, Mr. Lopez determined what was acceptable. For example, he determined that the branch would be the point of contact for flexural strength apparatus proposals from the manufacturers.

Crystal Klemmer and Michael Drylie, both from the Army, took the lead for the military services, organizing conference calls and meetings to identify and validate the military services' technical requirements. They also scheduled meetings with the manufacturers to discuss the technical requirements. In addition, Ms. Klemmer and Mr. Drylie made the ultimate decisions on technical requirements to be included in the revised MIL-DTL-8971 based on the input from the manufacturers, the military services, and DLA Aviation.

Program News

DSPO's Trudie Williams Receives SES Fellow Award

The Standards Engineering Society (SES) presented awards at its 63rd Annual Conference, which was held in Ottawa, Ontario, Canada, on August 12, 2014. Trudie Williams, from DSPO, was awarded the SES Fellow Award. The award recognizes professional distinction in, and special contribution to, the field of standardization. Among other things, an SES Fellow is an individual who has regularly engaged in standards or standardization work for at least 10 years and who, by special contribution to the advancement of standardization or related documentation, has attained professional distinction.

ANSI Launches New Course on Leadership Strategies

The American National Standards Institute (ANSI) announced the launch of a new online education course on StandardsLearn.org, the premier online source for standards and conformity assessment education. The new course, "Leadership Strategies and Skills: The Fundamentals," joins a wide array of easy-to-use educational tools that address the full range of standards activities. All of the resources and courses hosted by StandardsLearn.org are free and provided by ANSI as a public service. "Leadership Strategies and Skills: The Fundamentals" provides users with a detailed overview of significant leadership characteristics, as well as focused guidance on how to pursue strategies to develop and improve related skills. The course is relevant to individuals who are new to leadership roles or who are seeking to brush up on their leadership skills; it is applicable to all types of leadership positions. The course also includes specialized guidance on leadership topics relevant to standards-setting environments, including the duties and responsibilities associated with serving as a technical committee chair or convener in the international standards development process. To take the course, go to www.standardslearn.org and click "Leadership Strategies and Skills: The Fundamentals."

DoD has an organizational membership to ANSI. The membership offers access rights and discounts to DoD personnel on various products and classes, and it offers opportunities to participate on ANSI committees, panels, and forums.

Events

Upcoming Events and Information

October 23, 2014, Washington, DC

U.S. Celebration of World Standards Day 2014

The U.S. Celebration of World Standards Day will be held at the Fairmont Hotel in Washington, DC. This year's theme—Standards Level the Playing Field—focuses on how standards stimulate trade and overcome artificial trade barriers, helping to make companies, industries, and economies more competitive. The event is sponsored by the American National Standards Institute (ANSI). For more information on the event or to register, go to https://eseries.ansi.org/source/Events/Event.cfm?EVENT=WSD_14, or go to www.ansi.org, click "Meetings & Events," and then click "Upcoming ANSI Events."

October 27–30, 2014, Springfield, VA

17th Annual NDIA Systems Engineering Conference

This year's Systems Engineering Conference will be held at the Waterford Conference Center in Springfield, VA. The focus of the conference is on improving acquisition and performance of defense programs and systems, including network-centric operations and data/information interoperability, systems engineering, and all aspects of system sustainment. The conference is sponsored by the Systems Engineering Division of National Defense Industrial Association (NDIA) and is supported by the Deputy Assistant Secretary of Defense for Systems Engineering; the Office of the Under Secretary of Defense for Acquisition, Technology and Logistics; and the Office of the DoD Chief Information Officer. For more information, please go to www.ndia.org and click "Meetings and Events."

December 1–4, 2014, San Antonio, TX

2014 DMSMS Conference

The 2014 Diminishing Manufacturing Sources and Material Shortages (DMSMS) Conference will be held at the Grand Hyatt San Antonio and the Henry B. Gonzalez Convention Center in San Antonio, TX. Details on the technical program are still being worked out, but the event promises to be top-notch in every way. For more information on the event, go to www.dmsmsmeeting.com.

People

People in the Standardization Community

Welcome

Robert Gold recently assumed the positon of director of mission assurance within the Office of the Deputy Assistant Secretary of Defense for Systems Engineering. He is responsible for systems engineering, development planning, and specialty engineering policy and guidance and for the DSP. Previously, Mr. Gold served as the director for information systems and cybersecurity within the Office of the Assistant Secretary of Defense for Research and Engineering.

Wade Schubring recently assumed the position of Army Departmental Standardization Officer (DepSO) within the Army Materiel Command (AMC). Mr. Schubring started his career in 1987 as a mechanical engineer with the manufacturing facility at Rock Island Arsenal (Illinois). Before moving to AMC in 2009, he was chief of the Process and Capabilities Reengineering Group for U.S. Army Tank Automotive Command at Rock Island. At AMC, he has been working within the Industrial Base group.

Farewell

Bryant Allen retired on September 8, 2014. He demonstrated superior dedication and exceptional ability as the DepSO for the U.S. Army. His last 5 years serving as the Army DepSO culminated a distinguished 25-year career with the government, including working for naval shipyards, the Defense Contract Management Agency, the Missile Defense Agency, and the Army's Logistics Support Activity. We wish him happiness and success in the years ahead.

Robert "Scott" Kuhnen retired from the Air Force Materiel Command after 46 years of federal service. During acquisition reform, Mr. Kuhnen was a key Air Force engineering focal point, working on the Air Force's implementation of Mil-Spec Reform as well as serving on multiple integrated product/process implementation teams in support of many DSP initiatives. Over the years, Mr. Kuhnen has provided a strong, positive voice within the Air Force in support of standardization. Through his many noteworthy accomplishments, he has contributed significantly to the successful progress of the DSP. We wish him well in retirement.

DPMP Defense Parts Management Portal

Defense Parts Management Portal–DPMP

The DPMP is a new public website brought to you by the Parts Standardization and Management Committee (PSMC) to serve the defense parts management community.

The DPMP is a new resource, a new marketplace, and a "one-stop shop" for parts management resources. It is a navigation tool, a communication and collaboration resource, and an information exchange. It gives you quick and easy access to the resources you need, saves you time and money, connects you to new customers or suppliers, and assists you with finding the answers you need.

This dynamic website will grow and be shaped by its member organizations. A new and innovative feature of the DPMP is its use of "bridge pages." Organizations with interests in parts and components are invited to become DPMP members by taking control of a bridge page. Chances are good that your organization is already listed in the DPMP.

There is no cost.

Explore the DPMP at https://dpmp.lmi.org. For more information, look at the documents under "Learn more about the DPMP." Click "Contact Us" to send us your questions or comments.

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 2014	DMSMS
October/December 2014	NATO/International
January/March 2015	Non-Government Systems

If you have ideas for articles or want more information, contact Tim Koczanski, Editor, *DSP Journal*, Defense Standardization Program Office, 8725 John J. Kingman Road, STOP 5100, Fort Belvoir, VA 22060-6220 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.


DEFENSE STANDARDIZATION PROGRAM
MAKING SYSTEMS WORK TOGETHER