the newsletter of Reliability, Maintainability, and Supportability

December 2018
Volume 22
Issue 4

in this issue

The Evolution of DMSMS Management in DoD: We've Come a Long Way but Barriers Remain
Jay Mandelbaum, Tina M. Patterson, Robin Brown, & Dr. William F. Conroy III
Page 1

Reprint permission, "Defense Standardization Program Journal" April/June 2016

Of What Relevance Is It?
Russell A. Vacante, Ph.D.
Page 1

Some Thoughts On Military Operational Availability
Dr. Michael S. Waltert
Page 9

The Evolution of DMSMS Management in DOD: We've Come a Long Way but Barriers Remain by Jay Mandelbaum, Tina M. Patterson, Robin Brown, & Dr. William F. Conroy III

To set the stage for this article, we begin with a quiz. Which of the following two quotes was said in the last two years and which of the following was articulated more than 25 years ago?

1. "DoD Components shall assure that timely actions are initiated when a development program or an end item production or support capability is endangered by the lack, or impending lack, of manufacturing sources for items and material."
2. A Deputy Assistant Secretary of Defense "… expressed his concern over how Diminishing Manufacturing Sources and Material Shortages (DMSMS) were adversely affecting the readiness of weapon systems."

Continued on Page 2

Of What Relevance Is It?

by Russell A. Vacante, Ph.D.

It may seem that reliability has little relevance in your daily life— at least until something fails. It could be a car engine failure on a busy highway, or a computer that didn't boot up resulting in a missed major project deadline, or a refrigerator motor that dies spoiling a week's worth of groceries or a pacemaker that failed to send a charge to a heart at a time of need.

The message here is that when systems reliability is high, the important role it plays in product satisfaction generally is unappreciated. Because we often take highly reliable systems for granted, matters such as dependability and safety are seldom discussed during system usage. According to the Department of Transportation there were 797.5 thousand flights in the United States carrying 79.1million people in 2017. If aircraft reliability was a major concern there would be fewer people flying and a great reduction in the number of flights annually.

On a more immediate personal level, when was the last time most of us stopped to admire the workings of the human heart? How many of us are aware that it beats on average 42 million times a year, or 3 billion times during our lifetime? Its amazingly high and dependable reliability is infrequently celebrated by its users. The functioning of our hearts are only brought to our attention when there is a minor or major operational failure. The fact that the human heart functions so well has a

Continued on Page 12

Trick answer—both quotes are more than 25 years old. The first is from 1976 and the second is from 1989. But both still apply today. Does that mean DMSMS management practices have not changed for more than 40 years? No, it does not. This article provides a snapshot of what has changed.

Before discussing trends in DMSMS management, we first must establish a common understanding of what it encompasses. Per the current Department of Defense (DOD) DMSMS standardization document (SD) guidance (the SD-22)[1], "DMSMS management is a multi-disciplinary process to identify issues resulting from obsolescence, loss of manufacturing sources, or material shortages; to assess the potential for negative impacts on schedule and/or readiness; to analyze potential mitigation strategies; and then to implement the most cost-effective strategy."

DMSMS management should be carried out in a risk-based, proactive way. Proactive implies that efforts should be undertaken to identify issues as early as possible, thereby providing a longer window of opportunity to resolve them. This is important because the earlier an issue is identified, the greater the likelihood of a lower cost resolution. Risk-based implies that monitoring activities to identify issues are not necessarily applied everywhere—focus should be put on critical items most susceptible to obsolescence and requiring more time to implement a resolution.

To convey the evolution of DMSMS management, this article briefly examines some of the major contributing factors. The first two factors are primarily related to the underlying forces driving the need for DMSMS management. The remaining factors are mostly associated with performing DMSMS management operations.

- Military acquisition and system sustainment
- DOD-level DMSMS policy and guidance
- Proactivity
- Items monitored
- Automation
- Centralization
- Research skills

Changes to DMSMS Management Drivers

Two underlying trends in military acquisition and system sustainment that had a significant impact on the extent to which DOD systems face DMSMS issues.

DOD's reduced ability to influence industry to resolve DMSMS issues. The semiconductor industry illustrates this point since electronics represent a substantial portion of difficult to resolve DMSMS issues. In 1960, DOD accounted for roughly 50% of the global semiconductor market.[2] Such a market share provided DOD with considerable leverage on industry to deal with obsolescence. By 1979, DOD's market share had declined to approximately 10%[3] and its influence on industry had decreased dramatically. Today, DOD only accounts for 1%[4] of the market. This loss of influence is further exacerbated by the fact that, many of DOD procurements are low volume.

DOD's increasing emphasis on buying commercial components for military equipment to lower cost. A 1986 Defense Science Board (DSB) summer study[5] concluded that there are already many examples of commercial products being used In DOD systems and that the timing for greater commercialization is ideal. This DSB study was not the first to draw this conclusion; there were many other studies dating back to 1972 that support commercialization, the most notable of which is The President's Blue Ribbon Commission on Defense Management also known as the Packard Commission.[6] A chain of events from these two efforts led to the Secretary of Defense establishing policy in 1994 to decrease reliance on military specifications[7] and standards. From a DMSMS perspective, increased use of commercial products and pro-

1 Standardization Document (SD)-22, "Diminishing Manufacturing Sources and Material Shortages: A Guidebook of Best Practices for Implementing a Robust DMSMS Management Program," January 2015.

2 David C. Mowery, "Innovation, market structure, and government policy in the American semiconductor electronics industry: A survey Mowery" Research Policy, Volume 12, Issue 4, August 1983, pages 183-197.

3 Ibid.

4 Paige Turner, "An Overview of the Semiconductor Industry," September 10, 2015, http://marketrealist.com/2015/09/overview-semiconductor-industry/

5 Final Report of the Defense Science Board 1986 Summer Study on the Use of Commercial Components in Military Equipment, co-chaired by Dr. James R. Burnett and Dr. William J. Perry, January 1987.

6 A Quest for Excellence, Final Report to the President by the President's Blue Ribbon Commission on Defense Management, June, 1986.

7 Secretary of Defense Memorandum, subject: Specifications & Standards – A New Way of Doing Business, June 29, 1994, aka the Perry Memorandum.

THE BALUSTER GROUP

SERVICE DISABLED VETERAN-OWNED SMALL BUSINESS

Management Expertise • Engineering Experience • Strategic Insights

Management & Technical Expertise

The BALUSTER Group is a Service Disabled Veteran Owned Small Business (SDVOSB) that solves challenging management and technical questions. The company has competencies with regulatory, engineering and technical expertise, as well as, claims and litigation experience. BALUSTER's management and engineering consultants are experts in their fields and provide clients access to a full range of management, engineering, scientific and regulatory capabilities.

The company's core strength lies in its' management and technical personnel's comprehensive multi-disciplinary expertise and practical experience. With advanced degrees (Ph.Ds, MBAs, M.Eng, etc.), regulatory expertise and industry knowledge, BALUSTER's team is uniquely capable of addressing a wide range of projects, regardless of complexity or timeline.

The BALUSTER Group Team

The BALUSTER Group's Federal team offers a unique collaborative approach to solving problems that focus on appropriately staffing each engagement with the best-suited subject matter experts. This allows our clients to leverage the depth of knowledge held across our management and technical practice groups.

The Federal team is comprised of former senior executives from the U.S. government, business management executives, senior level engineers, policy analysts, and researchers.

COMPANY CAPABILITIES

- Accident Investigation & Analysis
- Aircraft Accident Reconstruction
- Applied Mechanics
- Automotive Accident Reconstruction
- Automotive Defect Analysis
- Automotive Regulatory Compliance
- Automotive Research & Testing
- Autonomous Vehicle Technology Integration & Policy
- Aviation Operations and Policy
- Block Chain Integration
- Chemical Engineering & Analysis
- Child Product Safety
- Commercial Vehicle Operation, Safety and Regulations
- Consumer Product Safety
- Crash Avoidance Technologies
- Crashworthiness
- Design Analysis
- Energy Analysis & Integration
- **Engineering Consulting**
- **Environmental Engineering & Science**
- Fire & Explosion Investigation & Analysis
- Hazardous Material & Waste Transportation
- Heavy Trucking & Commercial Vehicles
- Industrial Hygiene & Incidents
- Infrastructure
- **Management Consulting**
- Mechanical Engineering
- National Environmental Policy Act (NEPA)
- Railroad Technology & Safety
- Regulatory & Compliance
- Research & Design
- Risk Assessment & Analysis
- Safety Analysis & Engineering
- Statistics & Reliability
- Transportation Engineering & Research

www.theBALUSTERgroup.com

To learn more about the BALUSTER Group Federal team, call at (571) 334-4807, or send an email to cjbonanti@theBALUSTERgroup.com

SERVICE DISABLED VETERAN-OWNED SMALL BUSINESS cesses for DOD systems has implied that obsolescence will be a major problem because long life cycle DOD systems contain a great deal of short life cycle commercial electronics.

DOD DMSMS policy and guidance are also important drivers of DMSMS management. The following is a condensed chronology of major DMSMS-related events:

A DOD Directive on DMSMS was promulgated in 1976.[8,9] It is reasonable to assume that the timing was at least partially associated with DMSMS problems with electronics on military systems; at that point, the DOD share of the semiconductor market was only slightly greater than 10%. The Directive assigned responsibility for DMSMS policy and guidance to the then Assistant Secretary of Defense for Installations and Logistics. The Directive was not explicit about proactivity. It emphasized resolving issues promptly, before impacts to readiness and included approximately two pages of procedures.

The 1976 Directive was replaced in 1984.[10] Responsibility for policy for management of the DMSMS program was shifted to the Under Secretary of Defense for Research and Engineering. There also was a greater emphasis on proactivity—it included material about not designing with obsolete parts, it mentioned source availability research, and it emphasized data exchange along with the early issuance of discontinuation notices. The number of pages devoted to procedures expanded to nearly nine.

The 1984 Directive was replaced in 1991 by a DOD Instruction on acquisition procedures.[11] However, that new 562 page acquisition Instruction had minimal DMSMS content. This eradication of standalone policy occurred ostensibly at a time of increasing DMSMS concern as evidenced by the 1989 quotation at the beginning of this article. That quotation is from a report that developed an action plan for "both reactive and proactive steps to ameliorate the impact of DMSMS on DOD weapon systems.[12]" It should be noted that at the time the 1989 report was published, the Under Secretary of Defense for Research and Engineering was no longer acting as the DOD DMSMS focal point as evidenced by the following statement by John Mittino, the Deputy Assistant Secretary of Defense for Logistics. "I understand at your last

8 DOD Directive 4005.16, Diminishing Manufacturing Sources and Material Shortages (DMSMS), December 3, 1976.
9 This is the source of the first quotation at the beginning of the article.
10 DOD Directive 4005.16, Diminishing Manufacturing Sources and Material Shortages Program, May 16, 1984.
11 DODI 5000.2, Defense Acquisition Program Procedures, February 23, 1991.
12 Deputy Assistant Secretary of Defense for Logistics, Report on Diminishing Manufacturing Sources and Material Shortages, Fiscal Year 1989.

symposium in Phoenix, Arizona, that there was a real concern about a lack of an Office of Assistant Secretary of Defense focal point for DMSMS. I want you to know that since that symposium I have volunteered to be that focal point.[13]"

All DMSMS policy was not deleted with the cancellation of the 1984 Directive. More than three pages of procedures had existed in a consolidated materiel management regulation first published in 1993.[14] Although the underlying documents have been renamed and updated along with some changes to the DMSMS content, similar material remains in force today.[15] In January 2015, one sentence on DMSMS was added to the logistics enclosure of DOD's defense acquisition system instruction.[16]

A number of supplemental guidance documents associated with various aspects of DMSMS management operations were published between 1999 and 2005. The first Defense Acquisition University continuous learning course on DMSMS was released in May 10, 2005.[17] The first of five DMSMS standardization documents was issued in 2006.[18]

Trends in How DMSMS Management Operations Are Conducted

Proactive DMSMS management (identifying issues as early as possible) often leads to lower cost resolutions. DMSMS management proactivity has been increasing as the information revolution came to the DOD.

In the 1970s, DMSMS management was primarily reactive. When an item became obsolete, DMSMS practitioners searched (often manually) parts catalogs for alternatives. Although the idea of proactivity was implied in the 1984 Directive, the word itself was not included.

By the latter half of the 1980s, as evidenced by the aforementioned 1989 report, the need for proactive DMSMS management became part of the standard vocabulary of the DMSMS community. It was enabled, to a significant degree, by automated tools and databases. Proactivity remains extremely important today; many (but not all) programs engage in robust, proactive DMSMS management practices.

The items being proactively monitored have also expanded over time, most extensively in the past decade

In the 1980s and 1990s, DMSMS management primarily focused on electronics; commercially available databases of electronic parts were an enabler. This focus expanded in the mid-2000s to encompass commercial-off-the-shelf (COTS) items and mechanical systems because (1) the prevalence of COTS assemblies in DOD systems had been increasing and (2) mechanical systems were experiencing increased obsolescence due to their long (and sometimes extended) service life. Vendor surveys and internet research were the principal data sources. The 2015 version of the SD-22 also contains guidance on DMSMS management for materials and software. A few programs have initiated efforts in the software arena; proactive DMSMS management practices for raw materials are less mature.

Trends in automation have led to meaningful improvements in DMSMS management practices.

Commercial electronics databases that provide information about the status of parts (e.g., have they been discontinued or when they are expected to be discontinued), sources, specifications, etc. appeared in the early 1980s. Over time, these commercial databases have become more accurate, they include more parts, and they provide more information about the parts. In addition, the companies providing those databases have increased the DMSMS management services that they offer.

These databases have also been incorporated into larger DMSMS management information systems starting in the late 1980s, and, these larger systems have themselves improved over time. For instance,

13 John A. Mittino, Deputy Assistant Secretary of Defense for Logistics, Keynote Address, Government/Industry Electronic Parts Nonavailability (DMSMS) Symposium, March 14, 1989, Williamsburg, Virginia.

14 DOD 4140.1-R, DoD Materiel Management Regulation, Office of the Under Secretary of Defense for Acquisition and Technology. January 1993. That document consolidated material from multiple stand-alone directives and instructions that just been cancelled by DOD Directive 4140.1, Material Management Policy, 4 January 1993. While some of the DMSMS content of DOD 4140.1-R was new, a significant amount of its material was derived from the cancelled DOD Directive 4005.16 and from DOD Instruction 4115.40, Life-of-Type Buys of Secondary Items, December 19, 1983.

15 DOD Manual 4140.01, Volume 3, February 10, 2014, incorporating change 1 effective March 9, 2017, DoD Supply Chain materiel Management Procedures: Materiel Sourcing.

16 DOD Instruction 5000.02, Operation of the Defense Acquisition System, January 7, 2015.

17 CLL 201, DMSMS Fundamentals.

18 SD-22, Diminishing Manufacturing Sources and Material Shortages (DMSMS) Guidebook, Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, November 1, 2006.

they have become more web-based, their report generation capability has increased, they have incorporated data on non-electronic items as a result of vendor surveys, they have become more user friendly, and linkages with logistics databases have been established in order to estimate the date that an obsolete item will impact availability.

The centralization of DMSMS subject matter experts within large DMSMS service providers has also changed the character of DMSMS management.

As automation increased, program offices have turned more and more to the large and increasingly more capable DMSMS management information systems or other centralized providers of DMSMS management services for subject matter expertise. In the 1970s and 1980s, individual program offices monitored their own items using on-staff subject matter experts. These experts were called upon to manually research resolutions once an item was no longer available, an entirely reactive approach.

While a program office can still develop its own in-house expertise to perform DMSMS management functions using the latest tools available, it is generally not a best practice. It will take time to train an in-house engineer on the tools and the intricacies of DMSMS management. People with high levels of expertise, and with many more years of experience applying that expertise than an in-house engineer, can be easily secured today from the organizations providing the centralized DMSMS management information systems and/or centralized DMSMS management services.

Automation and centralization have yielded improved research capabilities to develop potential resolutions to DMSMS issues.

The early DMSMS practitioners in program offices and in the Defense Logistics Agency had substantial research skills. They were the first ones called upon to verify whether an item could still be purchased, and if not, to suggest possible alternatives. Today, as a result of the expanded automated capabilities and multiple platform experience, the subject matter experts supporting the DMSMS management information systems have the capability to quickly provide high quality research results.

Summary

Since 2001, when the last DOD DMSMS Directive was cancelled, the only official DOD DMSMS *policy* has been some limited procedures included in material management/supply chain issuances and one sentence in acquisition policy that appeared in 2015.

Despite this lack of progress in the policy arena, we have described significant trends in how DMSMS management capability has improved over time. To some degree, the capability has kept pace with the greater demands for robust, proactive DMSMS management resulting from the increased complexity of new weapon systems, the greater use of COTS assemblies, and the extension of the life cycle of older platforms.

DMSMS management *guidance* has similarly kept pace. The DMSMS community has demanded improved DOD guidance and that demand has been met. The first SD-22 was published in 2006. The current SD-22, dated January 2015, is the fifth version to be issued in a 10-year time span.

What's Next?

Even though there have been many advances, there is always room for further improvement. We know this is true and that additional benefits could be achieved because not all programs have adopted a risk-based, proactive approach.

According to Eric Grothues, the DMSMS lead for the Department of the Navy, "DMSMS has impacted virtually every weapons system throughout DOD. A DMSMS management policy requiring programs to develop and implement a process that is well-grounded on pro-active DMSMS management principles, tailored to mitigate the programs specific obsolescence risks, would provide program managers with the traction needed to get their weapons programs up to speed."

As more and more programs then begin to pursue a risk-based, proactive approach to DMSMS management, there will be further cost reductions and fewer schedule slippages and readiness impacts due to DMSMS issues. ■

About the Author

Jay Mandelbaum, while researching obsolescence policy, guidance, and training over the past seven years, was instrumental in developing ways to use value engineering to resolve obsolescence issues.

Tina M. Patterson has been

researching and developing obsolescence policy, guidance, and training over the past seven years. Before that, she was involved in similar activities for systems engineering.

Robin Brown is the DoD Diminishing Manufacturing Sources and Material Shortages (DMSMS) Lead. Before that she, was the NAVAIR DMSMS Lead, provided support to all NAVAIR Program Offices, served as co-chair of the DoN DMSMS Working Group, and participated as a member of DoD DMSMS Working Group for the past 15 years.

Dr. William F. Conroy III has been assigned to Defense Acquisition University as a Professor of Life Cycle Logistics Management and Production, Quality & Manufacturing since 2005.

RMS Partnership Membership

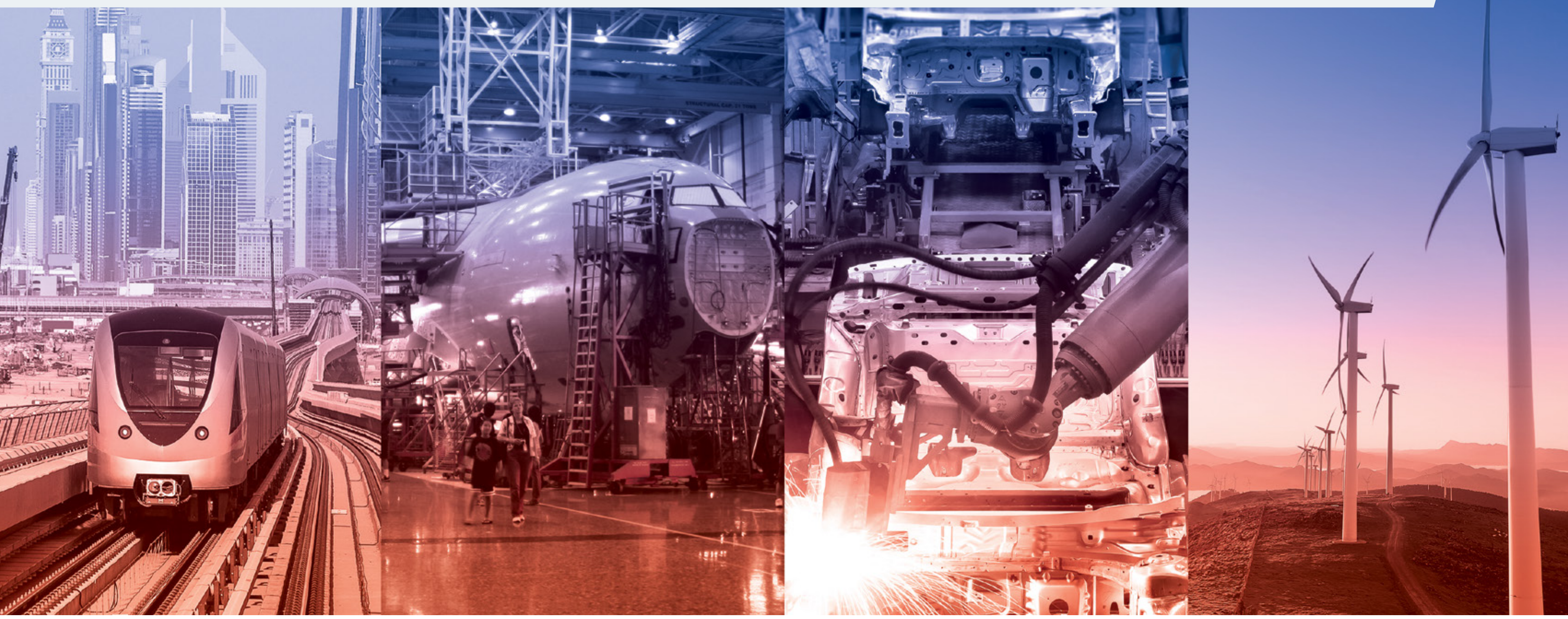
Sign up today! Membership Dues Only $35.00 Annually. See Membership Benefits and Registration at: www.rmspartnership.org
Please contact president@rmspartnership.org if you have questions about membership.

Interested In Contributing?

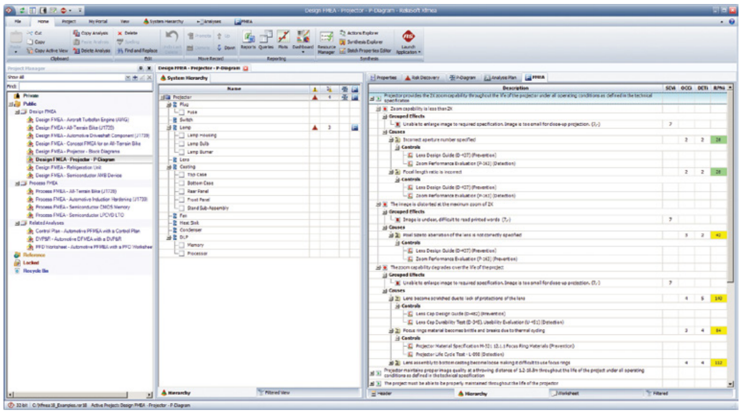
If you are interested in sharing your knowledge in future editions, please contact Russ Vacante at president@rmspartnership.org
Articles can range from one page to five pages and should be of general interest to our members.

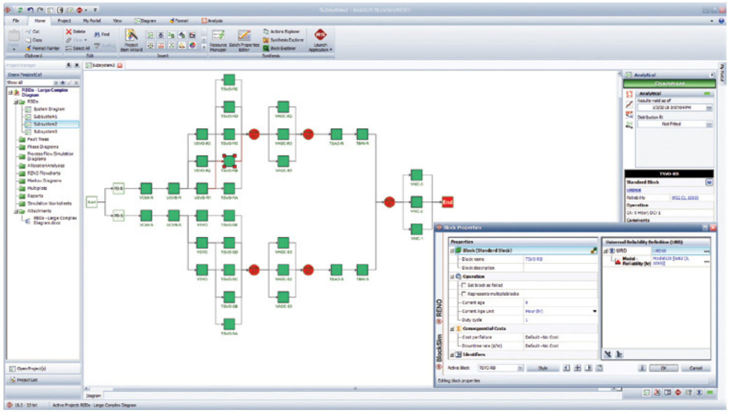
Prenscia HBM

Reliability and maintainability software and services



ReliaSoft promotes the use of engineering methodologies to evaluate and improve reliability and maintainability through software, services and solutions. Our products facilitate a comprehensive set of reliability analysis techniques, including life data analysis (Weibull analysis), quantitative accelerated life testing, system reliability/maintainability, reliability growth, design of experiments, standards based reliability prediction, FMEA, RCM, RBI, FRACAS and others. We also offer an extensive curriculum of reliability training courses that provide thorough coverage of both the underlying principles and theory, as well as the applicable software. Total life cycle support and expert resources are available on demand for organizations and projects of any size.





ReliaSoft

www.hbmprenscia.com

Some Thoughts On Military Operational Availability

by Dr. Michael S. Waltert

Issue Statement: When A_o is used as a key metric in the development of a system there are multiple ways of expressing this to the engineering community.

Discussion: Operational Availability (A_o) provides a method of predicting and assessing system performance and readiness during the acquisition process and then becomes the performance benchmark during initial operational capability (IOC), deployment and operations/maintenance segment. It also is a key performance parameter of any performance-based support acquisition falling within the auspices of the Department of Defense. According to Professor Ben Blanchard: "Operational Availability (A_o) is defined as the probability that the system will be ready to perform its specified function, in its specified and intended operational environment, when called for at a random point in time;"[1] or in more practical terms, "availability has been defined as the ability of a product to be ready for use when the customer wants to use it—it's available if it's in the customer's possession and works whenever it needs to."[2]

According to Mr. Anthony Trovato, CPL, former President of the International Society of Logistics Engineers, A_o is one of those areas where everything and everybody is right. Mr. Travato stated that in the field it may be better to calculate A_o in terms of maintenance actions since the systems are normally taken down (both up time and down time are measured) for such actions. In the manufacturing phase however, it may be better to use failures (MTBF = Reliability) *as the measure since it is on the manufacturing line that we work on the reliability growth.*

Response: I think you might want to rethink what you've written here. Reliability, per se, is a function of initial design. It must be designed into the system. However, during the manufacturing phase, production quality control will ensure that the components will meet the engineering standards of reliability that were designed into the system.

A current example of this is the Chinese practice of harvesting used computer components via cheap labor and selling them to their principle manufacturers as new components. The reliability was designed into the components, but the manufacturing quality control (lack thereof) ensures poor reliability for the final product.

One important factor to consider is the PM obtaining buy-in up front must ensure that all comparisons that are to be made evaluate like factors to like factors. When expressing the metric in terms of maintainability then maintainability must be used consistently, whereas if reliability is used, the reliability must be used consistently throughout. No matter the availability calculation used, each considers supportability either in terms of logistics delay or a combination of logistics delay and mean maintenance down time.

$$A_o = \frac{MTBM}{MTBM + MDT}$$

Figure 1: Operational Availability Calculation (Maintainability)§

The engineering approach (sometimes referred to as commercial availability) taught to most logistics engineers and managers, is shown in Figure 1. Within the academic and engineering arenas, the operational availability is expressed in terms of maintenance actions. It is also expressed here in terms of maintenance actions, as the actions causing a downtime are either scheduled or unscheduled. If we were to project forward using this methodology, once the unit is fielded, it will give the PM a better life-cycle view and enable him to better prepare for any pre-planned product improvement (P^3I) activities that will influence the Reductions in Total Ownership Costs (R-TOC).

$$A_o = \frac{MTBF}{MTBF + MTTR + MLDT}$$

Figure 2: Operational Availability Calculation (Reliability)

The engineering approach (sometimes referred to as military avail-

1 Blanchard, Benjamin S., Page 73, Fifth Edition

2 OPNAVINST 3000-12A, 3 September 2003, Page 10

§ Blanchard, Benjamin S., Page 73

ability) taught to most Government logistics engineers and managers, is shown in Figure 2. A_o is the primary measure of readiness for weapon systems and equipment. We determine A_o by using reliability (MTBF), maintainability (MTTR), and supportability (MLDT). As we have alluded to earlier, there is no right or wrong methodology for calling out A_o so long as each participant in the acquisition assumes the same definition. If we look to where we are in the acquisition cycle, it may behoove us to look at the different ways of calculating availability. Here we must look at what Professor Blanchard says with regards to this metric, "…if one is to assess a system in a realistic operational environment, then A_o is a preferred figure-of-merit to employ for assessment purposes."[3] Extrapolating from here, we can assume that the method of deriving Ao is situation dependent in accordance with the acquisition cycle the program office finds itself.

In recognition of this issue, Program managers could restate the A_o in terms that are measurable, quantifiable and relative to the program's phase in the acquisition cycle. Although the reliability stated equations stated above provide an accurate expression of A_o, they have two major deficiencies:

1. "Uptime and downtime can only be measured for a system in an operational inventory and are not measurable for a system in development.
2. If the A_o measured using this equation is less than the threshold required, the equation does not assist an analyst in determining what to do to increase the A_o."[4]

$$A_o = \frac{MTBM}{MTBM + MDT}$$

Figure 3: OPNAV Operational Availability Calculation (Alternative)

A reflects the real-world operating environment, thereby making it the preferred and most readily available metric for assessing quantitative performance.

A_o is usually not specified as a manufacturer-controllable requirement without being accompanied by estimates of the logistics resources and administrative delays, induced failures, etc. which are government driven and beyond the manufacturer's control.[5]

Conclusion: Although the policy makers within the services have recognized that A_o is an important Measurement of Merit this metric must be meaningful and measurable. As such, the calculation for A_o should be stated in terms that provide the warfighter with useful information and in terms that are applicable to the Milestone or phase of the acquisition. As such, **what we see is an A_o using reliability** as its basis is meaningful during early phases but in SDOE, the change to maintainability-based calculation may be more appropriate.

Response: A couple of things, Ben is not a doctor. He became a tenured professor at Virginia Tech, but without his doctorate. Amazing.

Regarding Figure of Merit, he used the term as a means of measuring a factor by its cost. Check your edition of Blanchard's Logistics Engineering text and you'll see what I mean.

Second, taking off from my note above about manufacturing reliability, I think you need to rethink your implied definitions of A0 and reliability. Blanchard gives them two distinct definitions. Check your text and you'll see what I mean. ■

About the Author

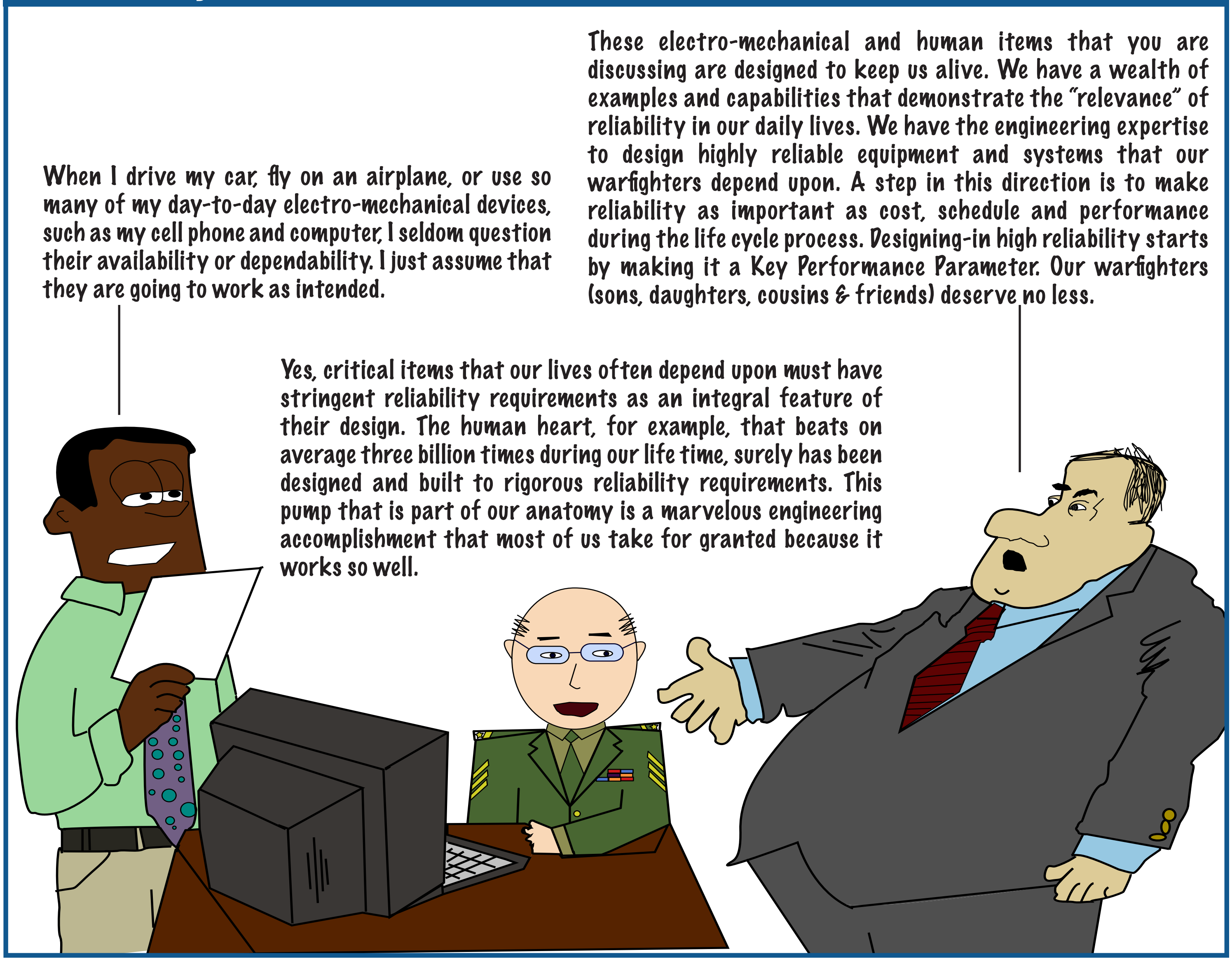
Dr. Michael S. Walter was born 20 March 1953 in Kansas City Missouri to a graduate civil engineer and his wife. He graduated from high school in 1971 received his BPA in 1979, his MS in 1988, and his PhD in 1993. He went to work for the City of Kansas City Missouri in 1971 as a Public Health Aide and was promoted to a Public Health Officer I in 1973 and in 1974 he was promoted to Public Health Officer II and Supervisor of Federal Grants. In 1975 Doctor Walter took military leave and joined the United States Air Force Reserves as a loadmaster and flew C-130B/E aircraft logging nearly 500 hours. He continued his education and in 1979 he again in 1979 went on military leave and went off to United States Air Force Officer's Training School at Lackland AFB Texas. He was commissioned a second lieutenant later in 1979. He was assigned as a logistics plans

3 Blanchard, Benjamin S., Page 73
4 OPNAVINST 3000-12A, 3 September 2003, Pages 73-74
5 OPNAVINST 3000-12A, 3 September 2003, Page 74

and programs officer in war plans from 1980 until 1988 when he became an acquisition logistician first as the deputy program manager for logistics for Air Force Systems the Deputy Director for Logistics. He was first assigned to the Joint Tactical Information Distribution System, a spread spectrum radio system then on to NATO AWACS followed by a final active duty tour in Joint STARS. After retiring in 1998 Doctor Walter continued on working with the US Government in a variety of roles consulting with the SBIRS Satellite System, the US Army, US Navy, DLA, and lastly the US Marine Corps.

Another Day At The Office

by Russell A. Vacante, Ph.D.



Editorial, from Page 1

great deal to do with high reliability being an inherent design (or perhaps evolutionary) feature. All of which leads us to ask why isn't robust reliability requirements an inherent design feature of so many more systems? We know it can be achieved with automobiles and aircraft and is a feature of our anatomy that both amazes and comforts us.

The above analogies are intended to draw attention to the fact that when systems, human or electro-mechanical, are working well we tend to ignore the important role of reliability and how it affects our daily lives. It is also safe to assume that most folks have little, if any, appreciation that reliability must be designed into a system at the start. The human heart is a highly reliable pump, just like so many electro-mechanical pumps on aircraft. Both are examples of critical systems (e.g., pumps) on which we are dependent for our safety and very lives.

However, if when designing our heart the design engineer had to conform to the cost, schedule and performance priorities that most program managers in the Department of Defense (DoD) find themselves obligated to follow, it is highly unlikely that we would be very accepting of its design. Under DoD standard program priority practices, critical requirements of reliability—though said to be of design importance—is truly of a secondary or tertiary level of design priority. Reliability must be an inherent primary design feature of all systems that we humans depend upon for our health, safety and our general well-being.

Trading off reliability requirements in order to meet cost, schedule and performance criteria most likely did not occur during the heart design process, since it plays such a critical life-sustaining role. The systems and equipment used by our warfighters has an equally life-sustaining role to play. They deserve the most reliable systems and equipment we can provide.

Yes, I do understand that we cannot always design and build systems-of-systems (SoSs) that have the same robust reliability as the various organs in the human anatomy. However, we can have this level of reliability as a goal for most military systems and equipment used by our warfighters. Our finite resources, human limitations, and the often-churning events of our highly charged global-political world will impose cost, schedule and performance priorities on the systems we design and build. However, by giving reliability requirements the same weighted values as cost, schedule and performance in the system design process a major step can be taken to expediently improve the reliability of military systems and equipment used by our warfighters.

Making reliability a mandatory Key Performance Parameter (KPP) as opposed to a mandatory Key System Attribute (KSA) (a second level of priority), would be a major step towards helping ensure that reliability is designed into most major military systems. While sustainment is a noteworthy KPP, it is not an engineering metric that can be evaluated and measured accurately throughout a system's life cycle. Under the sustainability of KPP, operational availability can be calculated using logistics parameters "that consider the effects" of reliability, maintainability and Mean Logistics Delay Time (MLDT) etc. This is an approach that places the proverbial cart before the horse possibly in an attempt to placate members of the defense community that may have little interest in investing small amounts of resources and time upfront to achieve high system reliability. Too often systems fail due to lack of incorporating robust reliability into its design. Instead, spare replacement parts are used to meet operational availability. Addressing the "effect" of logistics elements rather than establishing and maintaining appropriate measurable reliability requirements throughout a systems life cycle is proving to be technically unsound. It should not be a surprise to anyone in the defense technical community that major systems currently being acquired by DoD are experiencing cost overruns, schedule delays and less than expected performance due to not having robust reliability requirements integral to the system design process. ■