Mitigating Diminishing Manufacturing Sources and Material Shortages

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According to DoD 4140.1-R, diminishing manufacturing sources and material shortages (DMSMS) are "the loss or impending loss of manufacturers of items or suppliers of items or raw materials which may cause material shortages that endanger a weapon system's or equipment's development, production, or post-production support capability." DoD Directive 5000.1 makes the program manager accountable for total life cycle systems management: "The PM shall be the single point of accountability for accomplishing program objectives for total life cycle systems management, including sustainment."

While DMSMS are a fact of life, the key to effective mitigation is long-term, proactive planning by the program manager.

The Challenge for the PM
According to the Office of the Secretary of Defense publication *Performance Based Logistics: A Program Manager's Product Support Guide*, "material obsolescence may occur at the part, module, component, equipment, or other system indenture level. DMSMS obsolescence can occur in any program phase and can severely impact the program schedule, system availability, capability or cost. The PM must insure that performance based logistics product support efforts include an active DMSMS
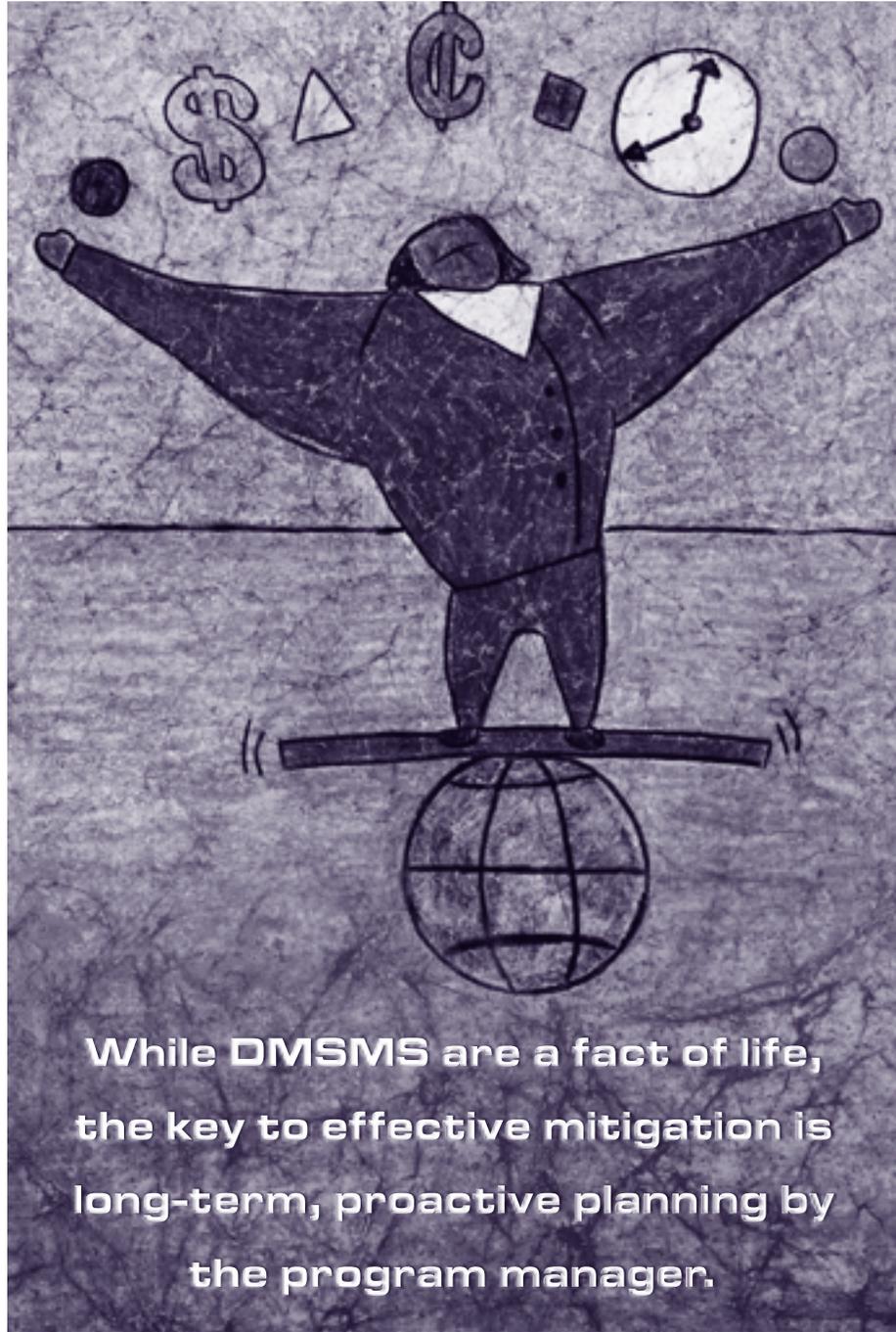
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process to anticipate occurrences and take appropriate actions."

Under total life cycle systems management, the program manager must balance traditional acquisition responsibilities for cost, schedule, and performance with life cycle support and sustainment (including DMSMS planning and management). PMs make scarce resource allocation decisions knowing the choice may come down to fielding a less supportable (less reliable) system or pursuing a more sustainable (more reliable) program. The dynamic tension is often acute, and unfortunately, DMSMS planning and funding are not always given the highest priority.

Simply supporting the system is a substantial undertaking, let alone planning for manufacturers of components and parts who may (will) eventually exit the market. So what's a proactive PM to do? Fortunately, there are ample resources and organizations available to assist.

A Range Of Proactive Solutions

If DMSMS and obsolescence are the problem, technology insertion, continuous modernization, open systems architecture, redesign, modifications, performance-based logistics (PBL), public-private partnerships, commodity councils, evolutionary acquisition, spiral development, and emulation are all tools to help the PM, the life cycle logistician, and/or the DMSMS manager ensure the continued supportability and sustainability of the system.

Possible methods are early identification through shared databases, inter-Service and inter-agency cooperation, and contractor participation; use of predictive tools; life of type buys; aggressive material improvement program and deficiency reporting programs; use of engineering change proposals (ECPs) and value engineering change proposals (VECPs) to upgrade and modernize components while maintaining interchangeability and F3 (form, fit, function); specialty manufacturers; reverse engineering; data rights; and drawing availability.

Committed leadership, proactive planning, stable funding, effective test and evaluation, best value sustainment, and timely execution are all important mechanisms to ensure supportable, operationally available, and mission-capable weapon systems.

Leadership

Along with up-front funding and commitment at the PM level, senior-level commitment, policy, tools, education, planning, and cross-functional collaboration are vital. The Navy, for example, plans to require a formal DMSMS plan for all cognizant ACAT programs other than those slated for retirement prior to January 2007, as well as evaluation of DMSMS as part of their independent logistics assessment process.

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Open Systems Design

According to OSD's *Performance Based Logistics: A Program Manager's Product Support Guide*, "open systems design can help mitigate risks associated with technology obsolescence, avoiding being locked into proprietary technology or relying on a single source of supply over the life of a system. … Spiral development also helps to alleviate obsolescence concerns. However, the PM must insure that performance based logistics product support efforts include an active DMSMS process to anticipate occurrences and take appropriate actions. This can often be carried out by the Product Support Integrator."

Early and Detailed Planning

Proactive DMSMS and obsolescence mitigation management demands detailed early planning, budgeting, and funding. It cannot begin after the system is in the field.

Teamwork and Cooperation

Cooperation between the government program office and original equipment manufacturer (OEM) is essential well before the Milestone C decision and entry into low-rate initial production, including development and integration of an up-front DMSMS-mitigation strategy in the system's PBL strategy. The PBL product support integrator should focus on and plan for reliability improvements, continuous modernization, and DMSMS planning for the duration of the product life cycle.

Bills of Material and Parts Lists

These documents are critical components of effective DMSMS management and should be part of doing business under PBL, whether delivered by the OEM to the government or made available in a shared data environment.

Continuous Modernization

By this process, state-of-the-art technologies are inserted continuously into weapon systems to increase reliability, lower sustainment costs, and increase the warfighting capability to meet evolving customer requirements throughout an indefinite service life.

According to the Defense Acquisition University PBL course, there are three additional obsolescence mitiga-

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creativity. Furthermore, VE creates incentives for government participants and their industry counterparts to achieve best value solutions as part of a successful business relationship.

■ **Performance-Based Logistics**. PBL offers a new and effective way to deal with obsolescence throughout the life of a product. Unlike traditional approaches to modernizing legacy systems, PBL holistically manages the sustainability and availability of weapon systems. As single-point responsibility for system availability shifts to the product support integrator under the program manager, PBL provides a powerful tool for mitigating obsolescence and making continuous modernization a reality for legacy weapon systems.

PBL clearly fulfills the need for continuous modernization and obsolescence mitigation. With PBL, the program manager contracts for availability rather than the logistics elements that contribute to availability. This is a long-term contract with an organic support source or a commercial contract source. The nature of the agreement award is based upon the performance guarantees that ensure a system is truly supported. Under a PBL arrangement, the support provider assumes support responsibility with accountability for meeting documented performance objectives, such as system availability or supply effectiveness. The government is buying output capability at an agreed-upon level and price, rather than purchasing discretely priced logistics elements on a transaction-by-transaction basis. The PBL contractor ensures that all elements of logistics support are available to provide an agreed-upon level of system availability on demand. The PBL supplier has the financial incentive to continuously improve performance because it has a bottom-line impact.

tion strategies to employ as part of an overarching continuous modernization approach:

■ **Engineering Change Proposals**. The ECP process has traditionally been one of the primary tools to mitigate obsolescence. Program and item managers use engineering support contracts with the OEM to implement pre-planned product improvement (P^3I) and to respond to product safety issues, manufacturing concerns, and reliability problems while the weapon system is in active production. P^3I is a long-range strategy for upgrading weapon systems capability to meet warfighter requirements. A P^3I is funded through acquisition funds and executed through engineering changes to production contracts, system retrofit programs, system block upgrade programs, or user-installed modifications.

■ **Value Engineering**. The DoD VE program reduces cost, increases quality, and improves mission capabilities across the entire spectrum of DoD systems, processes, and organizations. It employs a simple, flexible, and structured set of tools, techniques, and procedures that challenge the status quo by promoting innovation and

The DoD Program Managers Handbook—Common Practices to Mitigate the Risk of Obsolescence available at <http://www.dmea.osd.mil/docs/pmhandbook_rev_d.pdf> identifies three levels of practices to mitigate DMSMS:

Level 1 Practices to resolve current obsolete items (some may be considered reactive), are:
■ Assign DMSMS focal point
■ Conduct DMSMS awareness briefings
■ Facilitate internal communication
■ Facilitate external communication
■ Implement comprehensive DMSMS plan
■ Implement parts list screening processes
■ Implement parts list monitoring processes
■ Resolve current DMSMS items
■ Create supportability checklist.

Level 2 Practices to mitigate the risk of future obsolete items (majority would be perceived as proactive) are:
■ Conduct DMSMS awareness training
■ Perform DMSMS prediction

- Implement DMSMS internal steering group
- Build commercial off-the-shelf list
- Develop DMSMS solution database
- Develop opportunity index
- Create Web site for DMSMS management.

Level 3 Practices to mitigate the risk of obsolescence when there is a high opportunity to enhance supportability or reduce total cost of ownership (proactive activities which may require additional program funding), are:
- Implement circuit design guidelines
- Produce behavioral VHDL [*very high-speed integrated circuit hardware description language*] model
- Conduct technology assessment
- Implement electronic data interchange
- Investigate technology insertion. Also referred to as technology transition, this is the process of applying critical technology in military systems to provide an effective weapon and support system—in the quantity and quality needed by the warfighter to carry out assigned missions and at the best value.

But What if We Didn't Proactively Plan?

What to do in situations where proactive DMSMS planning was inadequate, deferred, or simply never carried out? DoD 4140.1-R identifies a range of options through implementation of "the most cost-effective solution consistent with mission requirements":
- **Extend production**. Encourage the existing source to continue production.
- **Alternative source**. Use the current item specification to find another source. A smaller company might undertake production that is no longer profitable for a larger company.
- **Convert to Performance-Based**. Convert the existing item specification to a performance-based specification, which provides more flexibility in acquisition approaches and facilitates identifying another source.
- **Substitute items**. Obtain either an existing substitute item that will perform fully (in terms of form, fit, and function) in place of the DMSMS item or one that would satisfy one or more functions but might not necessarily perform satisfactorily in all of them (limited substitute).
- **Redefine requirements**. Accomplish this through applicable engineering support activities, and consider buying from a commercial source. This redefinition may include MILSPEC tailoring. Such a course of action might induce the emergence of additional sources.
- **Emulate**. Use current manufacturing processes to produce a substitute item (form, fit, and function) for the unobtainable item. The use of emulation technology is particularly effective in producing substitute microcircuits.
- **Make a bridge buy**. Make a "bridge buy" of a sufficient number of parts to allow enough time to develop another solution.

- **Make life-of-type buys**. Based on estimated life-of-system requirements, the DoD components may make a one-time procurement of enough material to last until the end items being supported are no longer in use.
- **Reissue GFE**. If a contractor using government-furnished equipment stops production, reclaim the GFE and reissue it to a new source to help establish production capabilities.
- **Reclaim parts**. Recover DMSMS parts from marginal or out-of-service equipment or, when economical, from equipment that is in a long supply or potential excess position.
- **Reverse engineer**. Reverse engineer the item to develop an exact replica through a review of available technical data, testing, physical disassembly and inspection, and analysis of functions performed by the item.
- **Modify or redesign the end item**. Do this to drop the part in question or replace it with another. This option may become more cost effective if the end item contains several DMSMS parts.
- **Replace the system**. The option of replacing the system in which the DMSMS item is used, while viable, may require extensive cost analysis.
- **Maintain inventory**. Require the using contractor, through contractual agreements, to maintain an inventory of DMSMS items for future DoD production demands. This option must be weighed against the cost of the DoD's maintaining an inventory and supplying the items as government-furnished material.
- **Obtain warranties**. Obtain a production warranty, if possible, from the contractor to supply the item or items for a specified time (life of equipment) irrespective of demands.
- **Share information**. Send the involved integrated materiel manager information that was originally obtained from industrial sources about an actual or prospective announcement of a manufacturer's intent to stop production. Such information will allow DMSMS broadcast alerts to be generated, if applicable.
- **Be vigilant**. Maintain post-action surveillance throughout the life of DMSMS items in the logistics system.
- **Remain responsive**. Respond to requests for requirements information needed to decide the best course of action for ensuring continued supply of DMSMS items.
- **Provide logistics support**. Timely responses are required to meet contractor-imposed final action deadlines. For DMSMS cases involving multiple parts and multiple users, establish integrated product teams to coordinate DoD assessment and response, ensuring that adequate logistics support may be maintained for affected weapon systems.

DMSMS Center of Excellence Leads the Way

The Defense Supply Center, Columbus (DSCC), serves as the DLA focal point for DMSMS management. The DSCC DMSMS Office is responsible for the DoD DMSMS Center of Excellence and the Shared Data Warehouse; and

for receiving discontinuation notices, determining affected items-of-supply (parts) within DLA, and advising other managing activities of affected parts. DSCC notifies the using activity of discontinued parts and identifies solutions, such as procuring life-of-type buys and evaluating the use of alternate parts. DSCC also serves as focal point for exchange of DMSMS information with international allies of the United States.

The DMSMS Center of Excellence was developed to encourage communication, education, and cooperation among interested and affected agencies within the DMSMS world, assisting everyone in achieving solutions to DMSMS challenges. The DMSMS Center of Excellence is supported by a cross-Service team, and through its Web portal at <www.dmsms.org>, it is intended as a single point of access for organizations seeking cost-effective solutions and resources for resolving obsolescence challenges. Benefits to the PM include a cooperative, predictable process for solving obsolescence problems and sharing solutions across the DoD; DMSMS support to small or large programs with limited funding; reduced costs across the DoD; enhanced weapon system readiness; and critical levels of support for the warfighter

The DMSMS Center of Excellence is developing DMSMS computer-based training modules for the DoD and industry workforce on the DAU Continuous Learning Center at <http://clc.dau.mil/kc/no_login/portal.asp>. DAU and DLA plan to jointly field modules covering DMSMS fundamentals, DMSMS for executives, DMSMS planning for DLA personnel, and DMSMS case studies/tools at approximately four- to six-month intervals beginning later this year.

Planning is Essential
The key to DMSMS mitigation is long-term, proactive planning. According to an April 2001 study by the North American Technology and Industrial Base Organization, "While DMSMS costs are rarely broken out separately, the USAF B-2 SPO conducted a business case analysis in 1997 of the impact of reactive versus proactive DMSMS practices on that system. That analysis concluded that, on average, proactive measures offered a significantly greater return on the investment."

The good news is there are ample resources and tools available to assist proactive PMs and logisticians who have the foresight to take advantage of them. The DMSMS Center of Excellence at <www.dmsms.org> provides a good starting point for additional information, resources, and related links.

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From my experience, I would strongly agree that leading a GDT was different from leading a more traditional collocated IPT. While many of the traditional leadership needs are the same, the GDT appeared to be much more sensitive to the communication methods used by leaders. I also found that I spent much more time thinking about how I could create collocated team-like social/collaborative opportunities through the GDT medium than I would have in a collocated team situation. I could not simply decide to invite the team to an all-hands session, nor could I afford (in dollars or time) to fly the entire team to monthly off-site or team meetings.

I developed the following takeaways for program managers of GDTs. They are the things a leader should consider beyond the other things he or she would normally do as leader of a traditional collocated IPT:
- Hire people (leaders and followers) who can function in a GDT—not everyone can.
- Keep in mind that leadership is more than forwarding e-mails and tasks. Over-communicate with rich context to make your off-site folks feel included and to improve the quality of their support to the team.
- Remember that personal relationships are made one e-mail message at a time.
- Face-to-face meetings are still important. Meet on team members' home turf when possible.
- Seek formal and informal feedback and look for miscommunications. Use multiple sources and techniques, as miscommunication issues are hard to detect.
- Establish regular virtual meeting times in which all team members can participate during their core working hours. Protect that time and use it judiciously, as it is scarce and precious resource.

The Future of GDTs in DoD
The use of GDTs within DoD acquisition will expand as the downsizing of the acquisition workforce continues in future budget years. Leading and participating in GDTs is different from leading and participating in traditional collocated teams, so it's important to recognize the differences and address them early in the team development process. Unfortunately, some program managers believe IT tools are the solution to the complexities of GDTs. While IT tools can facilitate information communication, they will not, in themselves, ensure an effective GDT. Program managers must recognize that in order to capitalize on the opportunities GDTs provide the acquisition workforce, they must modify the traditional leadership and management techniques they are accustomed to using with collocated teams.

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