How to Overcome Obsolescence and Diminished Manufacturing Sources at Defense Inventory Control Points

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Initiatives: Manufacturing Operations Strategy and Performance

Defense inventory control points struggle to keep spare parts in stock for critical legacy systems because of limited sourcing options. Supply chain leaders at inventory control points can use this research to minimize stockouts, reduce backorders and improve inventory availability.

Overview

Key Challenges

- Inventory control points (ICPs) are challenged by chronic stockouts of critical spare parts rendered obsolete for weapons and other operational hull, mechanical and electrical (HM&E) industrial systems that are still in use, but no longer made by the manufacturer.

- Materiels directors at ICPs are missing critical technical part data and life cycle sustainment plans for legacy weapon systems.

- ICPs experience excessive backorders, delays on key critical legacy systems, and parts undergoing obsolescence due to delivery and repair capability gaps from organic and contracted commercial providers.

Recommendations

Materiels directors at defense ICPs responsible for contract manufacturing operations strategy and repair operations sourcing should:

- Establish procurement sources for near-obsolete items by hosting strategic sourcing industry days, offering contracting performance incentives and partnerships to the aerospace and defense (A&D) industrial base.

- Obtain technical data rights on aging or obsolete equipment, if available, by utilizing Department of Defense (DoD) integrated product teams focused on engineering data, and collaborate with suppliers to design out obsolete parts.
Introduction

This research is geared toward defense and/or government supply chain leaders at strategic- (joint-) and operational-planning-level commands, including:

- U.S. Joint Chiefs of Staff and the Defense Logistics Agency (DLA)
- Combatant Commander’s Logistics Directorate (J-4) and their service components
- The military services’ Hardware Systems Commands (HSCs) at the operational level, which include various commands of the:
  - U.S. Army Materiel Command (AMC)
  - U.S. Air Force Materiel Command (AFMC)
  - U.S. Naval Supply Systems Command (NAVSUP)
  - U.S. Marine Corps Logistics Command (MARCORLOGCOM)
- International government (defense) clients, relative to their nations’ defense supply chain policies, who operate with the U.S. Department of Defense and its international coalitions

Within the DoD inventory management enterprise and across the four services, supply chain leaders are often referred to as “materials directors,” which include the various roles of directors of (fleet) logistics (group), directors of sustainment, directors of inventory management or directors of operations. This research aligns with these supply chain leaders across all DoD ICPs.

Inventory control points are often expansive, highly complex and bureaucratic.¹ Many career DoD supply chain leaders concur that it can take up to five years for an employee to fully understand the organization and how it operates. These locations serve as the key stock points to support inventory issuance under requisition by end-user operational units, as well as stock for depot repair.

— Defense Acquisition University (2019)
In the DoD, an Inventory Control Point (ICP) is defined as an organizational unit or activity within a DoD supply system that is assigned the primary responsibility for the materiel management of items for a particular service, or for the Department of Defense as a whole. Materiel inventory management includes cataloging direction, requirements computation, procurement direction, distribution management, disposal direction and rebuild direction.

The DoD is tasked with maintaining weapon systems and spare parts for industrial items, including legacy systems that are no longer in production at the original equipment manufacturer (OEM). DoD has an extensive network of suppliers that provide millions of parts to sustain its weapon systems. However, some parts are provided by a single source of supply. When these sources no longer provide parts, DoD faces challenges in maintaining its legacy weapon systems. The DoD loses a manufacturer or supplier when it discontinues production and/or support of needed items, raw materiels, or software, or when the supply of raw materiel is no longer available. As a result, the military services using these scarce industrial items often enter into a reactive situation at service ICPs, further impacting inventory on the shelves and assets under repair. This scenario is described as obsolescence and diminishing manufacturing sources and material shortages (DMSMS).

Inventory constraints typically occur during a weapon system's life cycle for two reasons:

- The DoD program executive office stops funding procurement efforts.
- The original manufacturer no longer exists, or makes the item in sufficient quantities.

Materials obsolescence and DMSMS needs to become a bigger focus for defense auditors and inspectors. Obsolescence and diminished manufacturing sources occur when the services fail to identify and provision for alternative sources.

The impact to readiness is not only operational but financial, and can prove to be very costly and create backorders for DoD and the underlying Tier 1 provider, especially in a multitiered supplier contract.

Proactive DMSMS management can mitigate risks, avoid costs, minimize quality deficiencies and prevent schedule delays resulting from the loss of a single source of supply. Defense supply chain leaders should align themselves with the DoD instruction (SD-22) on DMSMS. DoD has reported cost savings from proactive DMSMS management. For example, by integrating DMSMS management into the design and build process, the Virginia-class submarine program resolved more than 1,200 obsolescence issues and avoided more than $150 million in costs. Similarly, when an OEM indicated that an expensive system upgrade was required for the B-1 bomber due to an impending obsolescence issue, DMSMS determined that alternate parts were readily available. In this case, DoD estimated a cost avoidance of more than $300 million over 10 years.

Despite potential fiscal gains, the DoD remains negatively impacted by three predominant issues related to diminished sources and materiels shortages:
By collaborating with strategic suppliers, the ICP supply chain leaders can:

- Inventory shortfalls driven by obsolescence and diminished manufacturing sources
- Missing or nonexistent tech data impacting current and future sustainment plans for legacy systems
- Excessive backorders and high critical part counts on key legacy spare parts

- Improve item visibility
- Gain access to key part technical data for sourcing and repair efforts
- Assist in driving down repair turnaround times (RTATs) at defense depots
- Minimize excessive backorders, high critical part count items in support of inventory availability and weapon system readiness (See Figure 1 for the value-added benefits of collaboration.)
Supply chain leaders can use this research to learn how to better collaborate and engage suppliers in programs designed to improve materiel flow and accessibility. They can follow best practices identified by commercial industry providers and implement those into their acquisition planning and contract execution processes. Doing so will enable better prioritization and will maintain alignment with DoD’s time definite delivery (TDD) issue priority group (IPG) processes. Further, it will enable faster problem solving and better time to market for these complex legacy systems and parts. Following commercial best practices also supports the voice of the supplier efforts by enabling suppliers to present new supplier ideas and innovations on how to improve the relationship (see The Journey to Supplier Relationship Management Success: Step 1 — Program Design).

Analysis

Mitigate Obsolescence by Establishing Industry Days and Strategic Sourcing Incentives
It is crucial to maintain materiel availability of spare parts for obsolete weapon systems that are still in operation, but are no longer made by the manufacturer. Figure 2 shows an example of sustainment challenges including obsolescence for key aircraft of the U.S. Navy and U.S. Air Force (USAF) reported in 2018.

![Figure 2: Sustainment and Obsolescence Challenges for U.S. Navy and USAF Aircraft](image)

<table>
<thead>
<tr>
<th>Aircraft</th>
<th>Aging aircraft</th>
<th>Maintenance</th>
<th>Supply support</th>
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<tbody>
<tr>
<td></td>
<td>Delays in acquiring replacement aircraft</td>
<td>Unexpected replacement of parts and repairs</td>
<td>Delays in depot maintenance</td>
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<tr>
<td>B-52</td>
<td>✓</td>
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<td>✓</td>
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<tr>
<td>C-17</td>
<td>✓</td>
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<td>E-6C</td>
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<td>F-16</td>
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<td>F-22</td>
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<tr>
<td>AV-8B</td>
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<td>✓</td>
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<tr>
<td>C-2A</td>
<td>✓</td>
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<td>E-2C</td>
<td>✓</td>
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<tr>
<td>E-2D</td>
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<tr>
<td>EA-18G</td>
<td>✓</td>
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<tr>
<td>F/A-18A-D</td>
<td>✓</td>
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<tr>
<td>F/A-18E-F</td>
<td>✓</td>
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Source: GAO analysis of Air Force and Navy data | GAO-18-S78

As a result, ICPs are forced to take on greater risk by cannibalizing spare parts from existing weapon systems to equalize inventory gaps. According to a 2019 audit of spare parts for the Navy’s F/A-18 E/F Super Hornet, Navy officials removed spare parts from one aircraft to make a second aircraft operational. However, these actions create new risks, including:

- The possibility of parts breaking during removal or reinstallation
- Possible corrosion or maintenance issues arriving from aircraft being removed and exposed to the elements while awaiting replacement parts

These actions also short-circuit higher-level spare policies by enabling maintainers to temporarily address the problem with a band-aid approach, foregoing a longer-term and more sustainable solution. The spare-parts dilemma results from nonexistent or poorly planned working capital funding. Inventory control points often fail to fund strategic sourcing for hard-to-find legacy parts, either underfunding or
entirely cutting budgets from year to year as sustainment demands increase and materiel requirements change.

To overcome these challenges, it is crucial for supply chain leaders to focus their efforts on provisioning for obsolete items by establishing strategic sourcing “industry” days and offering contracting performance incentives to the aerospace and defense (A&D) supplier base. Industry days provide an opportunity to lay out the specific engineering and technical data requirements for industry providers to support and enable “definitization” of the obsolescence requirements. In addition, it enables new part production and repair capabilities within your industrial base by utilizing DoD organic working capital funds to supplement the suppliers. This enables DoD and its contractors to keep the supply chain generating replacements for new stock or depot sustainment. Specifically:

- Where possible, supply chain leaders arranged to eliminate repair delivery delays by developing alternative contracting through incentivized performance-based logistics (PBL) programs that reward timely compliance and penalize nonperformance.

- Next, they should create contracting competitions for specialized obsolete parts, making participation more attractive to suppliers by bundling critical part numbers into larger pools of parts for fulfillment.

- In doing so, they can collaborate with the program executive office to identify spare parts with chronically long lead times or that are under backorder (see Research Guide for Optimizing External Manufacturing Strategies).

- Supply chain leaders must work toward establishing a supply chain ecosystem of suppliers to partner with to solve the specific challenges presented by high-complexity, low-volume obsolescence and diminished manufacturing sources.

- They can kick off the move to establish that ecosystem by hosting an “Obsolescence and DMSMS Industry Day,” where capable contractors bid and partner on the complex parts required. In some cases, this group may be also able to identify opportunities for substitute parts.

- Supply chain leaders should review the DoD’s latest version of its “Industry Day — Source Selection Procedures” to ensure alignment with the best practices of hosting such an event. 10

In addition, supply chain leaders should partner with the ICP contracting directorate and other members of the integrated product team (IPT) to determine the best contracting strategy most beneficial to the warfighter and DoD. Supply chain leaders will want to ensure the right contract is developed and remains aligned with DoD Better Buying Power policies and PBL contracting best practices on should-cost determinations.

Ensure Future Sustainment and Establish a Technical Data Mindset and Processes

DoD ICPs often lack key technical part data needed in order to keep legacy weapon system supply chains fulfilled and life cycle plans active. Often, when technical data is available, it is of poor quality. To address that, ICP supply chain leaders should acquire technical data based on the latest engineering
changes, which translates to the last contract MOD. Additionally, technical data must be accurate in accordance with the latest engineering (configuration) drawings and the most recent contract modification (document) on record. Technical part data is required to produce or sustain the part and includes, in part, drawings, operating and maintenance instructions, specifications, inspection and test procedures, instruction cards, and engineering and support analysis data. However, sustainment plans for critical legacy systems and their spares typically are not fully identified nor developed, thus creating a reactionary survival situation.

The inability to acquire rights to technical data during the acquisition process, which may cost upward of $1 billion, can have far-reaching implications for DoD’s ability to sustain and competitively procure parts and services.

Moreover, having access to all or portions of the technical data allows the DoD to develop maintenance capabilities within the department, complete contracts to acquire or repair the spare parts, and develop alternative sources when the primary contractor is unable to furnish spare parts.

DoD can’t increase its repair capability because it doesn’t own the data rights and intellectual property for the obsolesced assets.

The data rights are often owned by defunct or acquired companies, placing ICPs at risk for procuring counterfeit replacement items as acceptable substitutes to parts deemed obsolete. However, during the life cycle of a weapon system, the materiels provisioning process usually breaks down due to organizational and cultural changes in how item managers oversee the spare parts process. Over time, knowledge gaps occur and DoD personnel lack guidance to rectify the problem. Eventually, program managers lose direction on how to address obsolesced suppliers, negatively impacting mission readiness and driving up costs.

Several steps can be taken to ease the problem:

1. Collaborate with program engineers on key legacy systems to identify key technical part data needed for current and future needs.

2. Focus on capturing technical data rights on aging or already obsolesced critical weapon systems by utilizing DoD integrated product teams (IPTs) focused on engineering data. This group should establish a prioritized list of critical parts by evaluating cost risk, time to mitigate risk and item criticality to warfighter readiness.

3. Source the most critical parts first. Capture and maintain updated technical data and publications on the parts. Identify and procure lower priority items at a later date when (working capital) funding is available.
It is critical to establish a technical data culture (mindset) among your item management staff by changing how they think about parts and technical data. This will assist ICP employees in identifying and capturing technical data for parts throughout the life of a weapon system. Initiate a technical data governance program by reviewing the **Ignition Guide to Building a Data Governance Program**. The end goal is to fund and request technical data early during the life cycle acquisition process or during the part's lifetime as required by independent logistics assessments (ILAs), which occur every five years for major defense programs. 

Figure 3 helps to determine what type of technical part data is required based on the life cycle phase. Collaboration with weapon systems program management offices is crucial to determine the level of technical part data required and to best structure your joint value creation effort and the various ways to capture key tech data (see **Focus on Six Capabilities to Master Supply Chain Customer Collaboration for Value Creation**). It is also important to identify which parts are currently supported, but run the risk of approaching obsolescence. Once done, it's best to request technical part data before the source is no longer available.

**Figure 3: The Four Phases of DoD Technical Data**

<table>
<thead>
<tr>
<th>Requirements, Strategies, and Plans</th>
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<tbody>
<tr>
<td>Program officials determine the long-term technical data and associated rights needs for their systems and document those needs in the program's acquisition strategy and acquisition plan.</td>
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<tr>
<th>Contracting</th>
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<tr>
<td>Program officials specify technical data requirements in solicitations issued to contractors. Contractors' proposals assert any restrictions on DoD's rights to technical data needed to produce a system. Program officials review and evaluate proposals, identify areas of disagreement, and may challenge contractors' assertions.</td>
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<th>Performance and Delivery</th>
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<tr>
<td>When contractors produce the system, they may assert some additional restrictions to technical data rights, which DoD may challenge. Contractors mark all data they deliver to DoD with the appropriate level of rights, and DoD reviews and evaluates these marks for consistency with DoD policies and agreements in the contract.</td>
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<th>Post-Performance and Sustainment</th>
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<tr>
<td>DoD may realize if it has acquired the needed data and rights when it sustains its systems. DoD uses data and rights to maintain, repair, and solicit for sustainment contracts for its systems. DoD may challenge data rights markings within 3 years of contract completion. DoD may also exercise options for additional rights and data that it did not initially acquire if this option is provided for in the contract.</td>
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**Note:** Although this process we illustrate in this figure focuses on technical data and technical-data rights, DoD officials stated that they also use most of the same process to acquire computer software and computer software documentation with some exceptions.

**Mitigate Backorders With Supplier Collaboration Strategies**

Backorders are defined as orders that are held in an unfilled status pending receipt of additional parts or equipment through procurement or repair. DoD’s supply chain management improvement plan specifies annual performance targets for backorders for each of the components and DoD overall.
DoD relies on many single sources of supply to provide parts for its weapon systems and has identified facilities that represent risks associated with single sources of supply. High numbers of backorders and delays typically occur with parts undergoing obsolescence due to delivery and repair capability gaps from organic and contracted providers. Often, there is no life cycle management or sustainment plan to address obsolescence or diminished manufacturing sources. It doesn't help that DoD ICPs and their respective program offices haven't performed independent logistics assessments (LSA) to identify root causes for part obsolescence and to identify early candidates.

For major defense acquisition programs (MDAPs), the LSA requirement is once every five years. As a solution, start to establish a supplier ecosystem of specialized providers to address key critical system spares undergoing obsolescence by identifying and partnering with providers that are willing and capable of sharing risks:

- To ensure demands are met, gain a full understanding of specific supplier needs by utilizing voice of supplier (VoS) surveys. Gartner’s VoS solution is a web-based tool that enables suppliers to rate the procurement organization's performance. In turn, procurement can independently rate its relationships with individual suppliers.

- The goal is for the defense ICP procurement to better understand supplier perspectives and highlight gaps between how a supplier believes it performs and how ICP procurement believes it performs (see Voice of Supplier Tool).

- The VoS will help ICP contracting directorate build a comprehensive map of relationships with suppliers and provide them with a clear understanding of the key elements of a healthy supplier relationship and what factors are most important to the DoD.

- Further minimize the impact of backorders from obsolesced by following the DoD process for working around backorders (see Figure 4 below). Backorder workarounds in DoD consists of conducting cannibalization actions, local procurement, expediting shipment and local manufacturing efforts.

- Create a strategy during the monthly depot sustainment or IPT meetings at the first sign of obsolescence or diminished sources that emphasizes greater collaboration with the highly specialized suppliers in that marketspace.

- Encourage the creation of OEM networks and shared risks across the suppliers with capabilities in solving challenges of obsolescence and diminished sources (see 3 Post-COVID-19 MRO Supply Chain Challenges A&D CSCOs Are Facing for 2020).

- When creating a supplier ecosystem, supply chain leaders can gain the greatest value by hosting a virtual or, when able, in-person supplier summit (see Increase Supplier Engagement Through Supplier Summits).

- Partnering with ICP procurement business partners (the contracting directorate) to deliver an effective supplier summit will stem engagement and investments to address the complex obsolesced parts.
DoD supply chain leaders should ensure intrasupplier collaboration by developing specific competencies that make it possible to operate a new supply chain ecosystem within the confines of the Federal Acquisition Regulations (FAR) and its defense supplement (DFAR).

Supply chain leaders can do this by collaborating with their respective contracting directorate head along with their legal or law business partner at their DoD organization (see New Dimensions in Collaboration: Scale Shared Value and Develop Supply Chain Ecosystem Partnerships).

As recommended by the GAO in its 2017 audit of DoD and its backorder management process, ICP supply chain leaders should establish metrics to measure and track disruption costs. Metrics include those such as demand forecast accuracy created by the lack of parts at depot maintenance industrial sites.

**Acronym Key and Glossary Terms**

<table>
<thead>
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<th>Definition</th>
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<td>An organizational unit or activity within a DoD supply system that is assigned the primary responsibility for the materiel management of a group of items, either for a particular service or for the Defense Department as a whole. Moreover, materiel inventory management includes cataloging direction, requirements</td>
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</table>
computation, procurement direction, distribution management, disposal direction and, generally, rebuild direction.

| Materiels | All items necessary to equip, operate, maintain, and support military activities without distinction as to their application for administrative or combat purposes, excluding real property, installations and utilities. Materiel is either serviceable (i.e., in an issuable condition) or unserviceable (i.e., in need of repair to make it serviceable). |

**Evidence**

4. Diminishing Manufacturing Sources and Materiel Shortages (DMSMS) Policy, Department of Defense.
6. SD-22 Instruction — Diminishing Manufacturing Sources and Materiel Shortages, Department of Defense.
8. Repair Turnaround Time (RTAT), Defense Acquisition University (DAU).


Recommended by the Authors

Ignition Guide to Building a Data Governance Program
Voice of Supplier Tool
External Manufacturing Strategy Guidance for Supply Chain Leaders
Focus on Six Capabilities to Master Supply Chain Customer Collaboration for Value Creation
Increase Supplier Engagement Through Supplier Summits
Win the Business Case for Investment to Improve Forecast Accuracy
3 Post-COVID-19 MRO Supply Chain Challenges A&D CSCOs Are Facing for 2020
Align Forecast Accuracy Lag Times With Supply Chain Action Points to Better Support Decision Making
New Dimensions in Collaboration: Scale Shared Value and Develop Supply Chain Ecosystem Partnerships