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New DMSMS Resolutions

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INSTITUTE FOR DEFENSE ANALYSES
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About This Publication

This work was conducted by the Institute for Defense Analyses (IDA) under contract HQ0045-14-D-0001, project DE-6-3405, "Fostering Proactive Diminishing Manufacturing Sources and Material Shortages (DMSMS) and Parts Management," for the Defense Standardization Program Office (DSPO) through the Defense Logistics Agency (DLA). The views, opinions, and findings should not be construed as representing the official position of either the Department of Defense or the sponsoring organization.

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Executive Summary

Diminishing manufacturing sources and material shortages (DMSMS) management is a multidisciplinary process to identify risks resulting from obsolescence, loss of manufacturing sources, or material shortages; to assess the potential for negative impacts on schedule or readiness; to analyze potential mitigations; and then to implement the most cost-effective resolution. Parts management is an engineering discipline for selecting parts for use in a Department of Defense system (or equipment) and take into account considerations that affect the design, production, operation, support, and disposal throughout the life cycle of the system. In March 2022, a Parts and Material Management Conference (PMMC) will cover both topics. The Institute for Defense Analyses (IDA) prepared or substantially helped craft seven briefings for this event.

Three of the briefings will be used for training; they will be presented by DOD practitioners.

- Standardization-related Document (SD) 22 is DOD's overarching DMSMS guidance. DOD published an updated SD-22 (written by IDA) in January 2021 and IDA is preparing another update. NS D-32993 is a substantially modified three-hour training course on the SD-22 processes.
- Development of a DMSMS Management Plan (DMP) is an important early step in DMSMS management. The January 2021 and forthcoming SD-22s formalized DMP development guidance. NS D-32973 is new DMP preparation training.
- DOD prime contractors perform many DMSMS procedures and even more parts management procedures. NS D-32996 makes minor revisions to existing training on DMSMS contracting and adds preliminary parts management contracting material.

IDA will present the remaining four briefings in technical sessions. These briefings cover the results of specific subtasks from several IDA projects performed in the last two years.

- NS D-32929 provides a detailed explanation of often-misunderstood DMSMS management interfaces with product, product improvement, supportability, and technology roadmaps. This material is a large part of the forthcoming SD-22 revision.

- NS D-32956 describes how to improve the content of manufacturing readiness assessments (MRAs) through a more rigorous consideration of DMSMS management and parts management in the assessment criteria. MRAs are regulatory requirements throughout DOD's acquisition process.
- NS D-32930 delves into cybersecurity and hardware assurance (HwA) considerations associated with implementing resolutions to DMSMS issues. IDA will also moderate a plenary panel on this subject at the PMMC. IDA plans to use these events to help formulate future policy recommendations.
- NS D-32962 defines new DMSMS resolutions and estimates their average cost. These changes contribute to a more accurate estimate of cost avoidance from proactive DMSMS management and also provide program offices with an initial estimate of resolution cost when no other information is readily available.

New DMSMS Resolutions

**Parts and Material Management
Conference
Denver, CO**

**Jay Mandelbaum and Christina Patterson
8 March 2022**



Outline

- **Background**
- **Why We Are Here**
- **Approach**
- **Preliminary Examination of DoC Data**
- **Definition of New Resolution Options**
- **Collection and Assessment of Cost Data**
- **Way Ahead**

Background (1 of 2)

- The SD-22—
 - Defines and describes examples for nine diminishing manufacturing sources and material shortages (DMSMS) resolution options

Resolution option	Average ^a
Approved item	\$1,165
LON (Life-of-Need) buy	\$5,928
Simple substitute	\$14,247
Complex substitute	\$28,779
Extension of production or support	\$28,850
Repair, refurbishment, or reclamation	\$73,637
Development of a new item or source	\$742,333
Redesign—NHA (next higher assembly)	\$1,237,793
Redesign—complex/system replacement	\$11,652,368

^a Average cost figures have been adjusted to 2021 dollars.

- Provides an average cost for each resolution option

Based on 2013-2014 Department of Commerce (DoC) Survey

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Background (2 of 2)

- The SD-22's average resolution costs table is used to:
 - Conduct business case analyses (BCAs)
 - Calculate cost avoidance
 - Preliminarily validate resolution cost estimates

This SD-22 average resolution cost table is only needed if a program office does not have actual cost data

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Why We Are Here

- The cost data supporting *develop a new item or source* average cost suggests that it may represent more than one type of resolution option
- We are here to:
 - Describe our approach to examine this resolution option to determine whether one or more new DMSMS resolution options and corresponding average cost information should be developed
 - Introduce the results of that effort
 - Three new resolution options
 - Preliminary average cost information for each new resolution
 - Describe the way-ahead to further refine the preliminary average cost information based on data collection in response to forthcoming DoDM 4245.15 direction on metrics

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Approach

- Perform a preliminary examination of the DoC data for the *develop a new item or source* resolution option
- Form a collaborative, government and industry team to:
 - Determine how to disaggregate the *develop a new item or source* resolution option
 - Define the new resolution options
 - Identify cost drivers for each of the new resolution options
 - Collect cost data for each of the new resolution options
 - Calculate an average cost (adjusted to 2021 dollars) for each of the new resolution options

The results of this effort have been used to update the resolution options and average cost tables in the SD-22

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Preliminary Examination of DoC Data (1 of 4)

- The *develop a new item or source* encompasses at least two resolution types
 - Develop a new source for the obsolete item
 - Develop a replacement item for the obsolete item

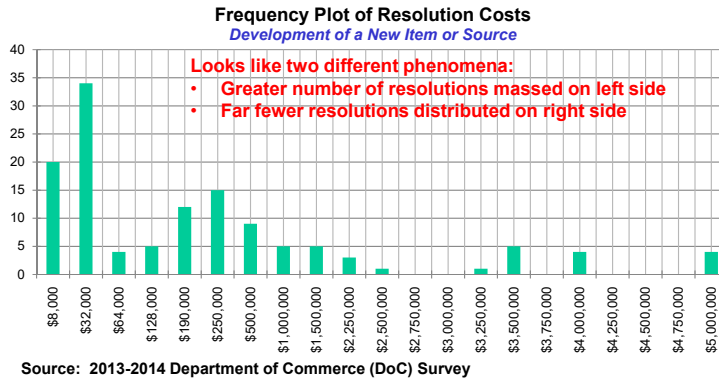
... and each of these may have different types and levels of non-recurring engineering functions and therefore different costs

Source: 2013-2014 Department of Commerce (DoC) Survey

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Preliminary Examination of DoC Data (2 of 4)

- Initial examination of DMSMS resolution cost and other data for the *develop a new item or source* indicates that there are likely more than one, distinct resolution option

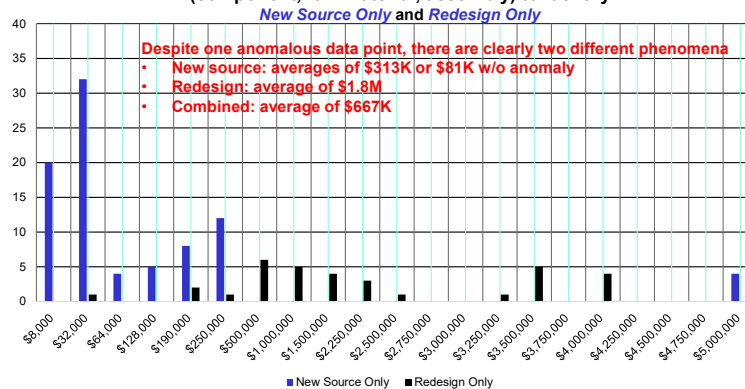


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Preliminary Examination of DoC Data (3 of 4)

- Further examination of the DoC resolution descriptions identified resolutions that were *new source AND redesigns*

Frequency Plot of Resolution Costs based on Resolution Descriptions and Part Type
(component, raw material, assembly) to Identify



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Preliminary Examination of DoC Data (4 of 4)

- Another consideration is the relationship between a redesign at the item level and one at the next higher assembly
 - If a *redesign* at the item level has an average cost of \$1.8M that exceeds the average cost of the *redesign at the next higher assembly resolution* (\$1.2M)
 - This seems counterintuitive and may indicate an additional, potential shortcoming in the DoC data used to calculate the average resolution costs
 - This effort did not attempt to address this issue as it was not possible to determine the complexity of redesigns at the item and NHA using the DoC data
 - Plan to address with better record keeping in the future

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Definition of New Resolution Options

Resolution Option	Definition
Development of a new source	<u>A new manufacturing/production source for the item is established using existing technical data without affecting the NHA.</u> If the government has not already obtained access to the technical data, the necessary technical data will have to be purchased or obtained by the government and provided to the new source. First article testing will be required along with any necessary testing to assure that the new item functionally meets all requirements when installed in the system.
Design refreshment	<u>The original item is replaced with a new item developed using existing technical data and without affecting the NHA.</u> The government either already possesses the bulk of the technical data for the unrefreshed item or it is generally available either at no cost or can be purchased. First article testing will be required along with any necessary testing to assure that the new item functionally meets all requirements when installed in the system. The manufacturing source for the new item may be the original manufacturer or a new source.
Redevelop the item	<u>The original item is replaced with a new item developed without the benefit of existing technical data and without affecting the NHA.</u> The new item may be developed by emulating, reverse engineering, designing a replacement based on the original manufacturing designs and processes, or designing a different item based on the original or new requirements. The manufacturing source for the new item may be the original manufacturer or a new source.

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Collection and Assessment of Cost Data (1 of 3)

- **Revisit the DoC to recategorize according to the three new resolution options**
 - Lack of clarity in descriptions often prevented categorization as one of the three new resolution options
 - Relative complexity of redesigns at item or NHA unclear
- **Collect data based on the three new resolution options from industry and military services**
 - Shared limitations:
 - Limited number of data points
 - Not clear that all data provided apply to the three new resolution options
 - Not able to collect data for the NHA level

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Collection and Assessment of Cost Data (2 of 3)

- **Overcame data challenges**
 - Relied on engineering judgement
 - Eliminated data outliers
 - Used DoC NHA average cost as an upper bound
- **Conversion of all cost data to FY22 dollars**
- **Calculation of average cost for the new resolution options**

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Collection and Assessment of Cost Data (3 of 3)

- **Average Cost for Resolutions**

New Resolution Options	Average Resolution Cost
<i>Approved item</i>	\$1,179
<i>LON buy</i>	\$5,999
<i>Simple substitute</i>	\$14,418
<i>Complex substitute</i>	\$29,126
<i>Extension of production or support</i>	\$29,197
<i>Repair, refurbishment, or reclamation</i>	\$74,524
<i>Develop a new source</i>	\$301,967
<i>Design refreshment</i>	\$879,821
<i>Redesign—NHA</i>	\$1,252,706
<i>Redevelop the item</i>	\$1,915,676
<i>Redesign—complex/ system replacement</i>	\$11,792,758

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Conclusion

- **SD-22 has been updated to incorporate:**
 - New resolution options and their definitions
 - Preliminary average cost for the new resolution options
- **Although the average costs for the three new resolutions are preliminary, they could still prove useful to**
 - Conduct BCAs
 - Calculate cost avoidance
 - Preliminarily validate resolution cost estimates**... if a program office does not have actual cost data**
- **Collect additional resolution cost data based on the application of forthcoming DoDM 4245.15-directed metrics**

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