



U.S. ARMY COMBAT CAPABILITIES DEVELOPMENT COMMAND C5ISR CENTER

DMSMS and Additive Manufacturing

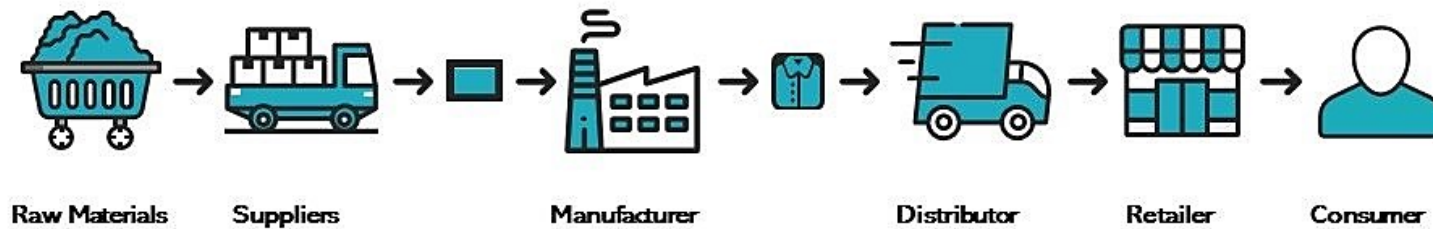
21 APRIL 2023

DMSMS OVERVIEW



Diminishing Manufacturing Sources and Material Shortages

Loss, or impending loss, of manufacturers or suppliers of items, raw materials, or software



Any part of the supply chain can cause a DMSMS issue

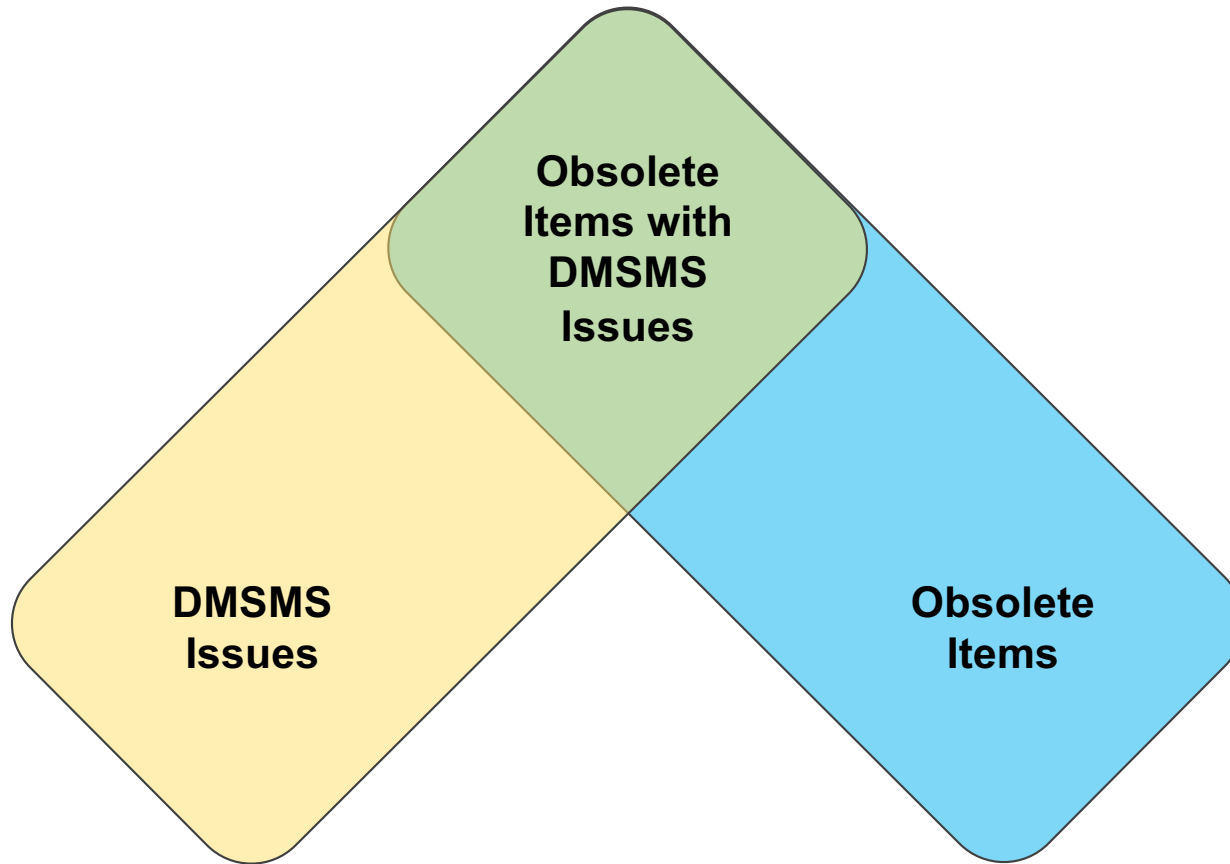
OBSOLESCENCE



- Several official resources define “obsolescence” in slightly different ways:
 - **SD-22:** a part is obsolete when it is “...*out-of-date and superseded by something new*”.
 - **DFARS:** parts which are “...*no longer available from the OEM or an authorized aftermarket manufacturer*”.
 - **IEC 62402:2019:** an obsolete part is one which “...*is no longer in production from the manufacturer in accordance with the original specification.*”

Parts are not considered obsolete simply because they are difficult to locate

DMSMS & OBSOLESCENCE RELATIONSHIP



There is no DMSMS issue if needed quantities of the part can be found within the marketplace

DMSMS MANAGEMENT PROCESS



All things go obsolete eventually

DMSMS STEPS EXPLAINED



DMSMS management is a multidisciplinary process to:

- *Prepare* the foundations for DMSMS processes and management.
- *Identify* items with obsolescence risks.
- *Assess* when and at what level (e.g., item or next higher assembly) to resolve the issue.
- *Analyze* the most cost-effective resolution.
- *Implement* the resolution.
- *Strategize* by evaluating results for DMSMS processes, improving effectiveness and efficiency.

Each of these steps applies throughout the system life cycle

DMSMS RESOLUTION OPTIONS



Basic

- Repair
 - Sufficient 'F' Assets
 - Divested Assets
- Stock on Hand
 - Sufficient "A" Stock On Hand
- Procure
 - Extension of Product Support
 - Existing NSN
 - Life of Need Buys
 - *Bridge*
 - *Life of Type*
 - *Lifetime*

Substitution

- Simple
 - Existing Item
 - Current Technology
- Complex
 - New Technology
 - New Requirements
- Engineering
 - Non-Recurring Engineering (NRE)
 - Modifications

Redesign

- Next Higher Assembly
 - NHA Modified
 - Multiple Items
- System
 - Major Assemblies
 - New System Baseline

See Appendix for more details



PROACTIVE DMSMS EFFORTS



A proactive strategy is a collaborative effort involving several elements



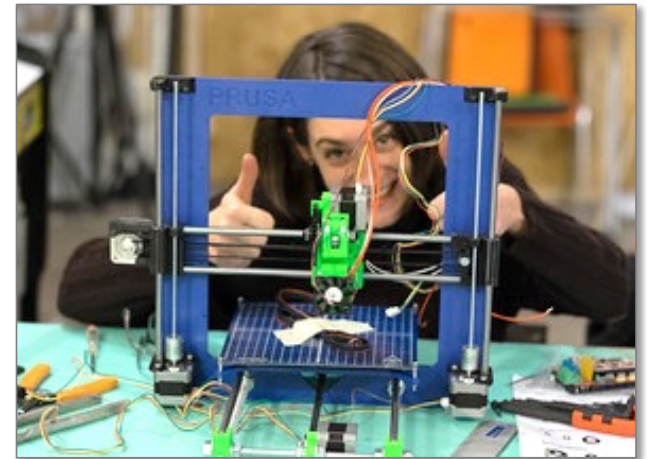
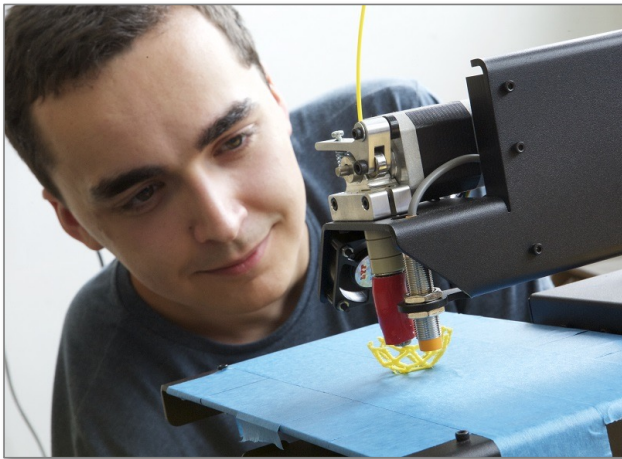
ADDITIVE MANUFACTURING.... ATSM DEFINITION

The process of making a three-dimensional solid object of virtually any shape from a digital model using an additive process, where successive layers of material are laid down in different shapes.

- *Seven commonly accepted types.*
- *Rapidly growing industry thanks to advances in computing, machine controls, expiration of original patents, etc.*
- *3D Printing is a subset of AM.*

Do weapons system engineers know this definition?

ADDITIVE MANUFACTURING.... WHAT MOST PEOPLE THINK



We all know people like this

COMMON WST CHALLENGES



Funding

- Not enough
- Takes too long to get

Lead time

- Too long to get existing parts delivered
- Too long to have parts made

Economy of scale

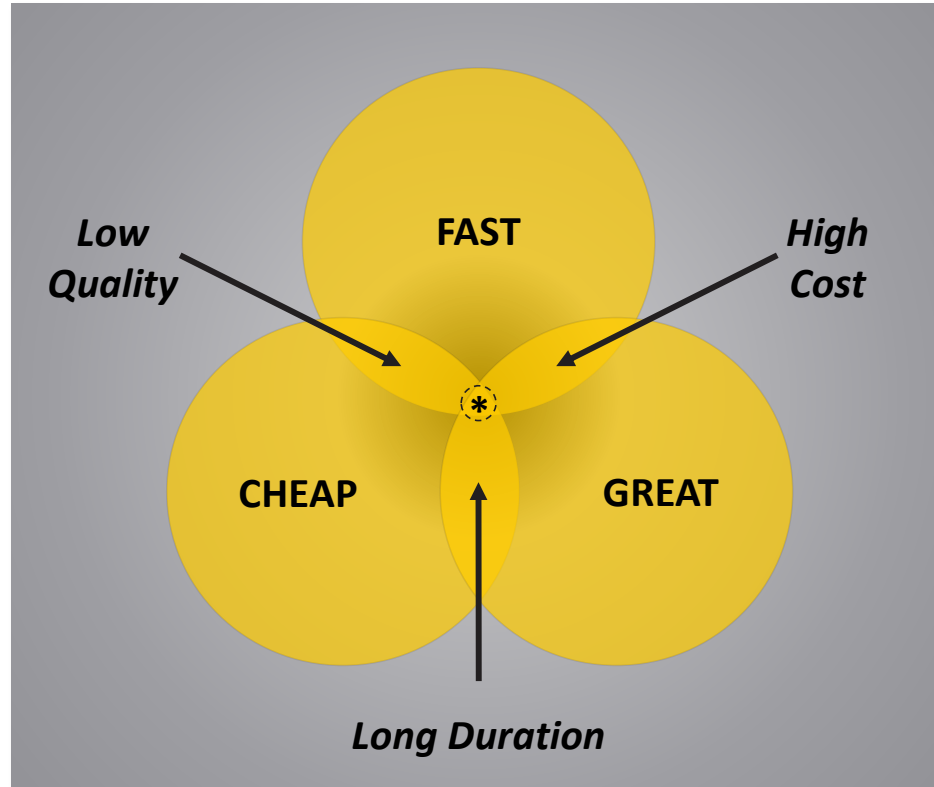
- Manufacturer's minimum production run for part vastly exceeds weapon system demand and/or budget

Form/Fit/Function

- New part model has changes that make it difficult or impossible to use with current system design (e.g., PS/2 Port vs USB)

Teams often face more than one challenge

THE QUALITY TRIANGLE



* *Unattainable*

There are no solutions, only tradeoffs

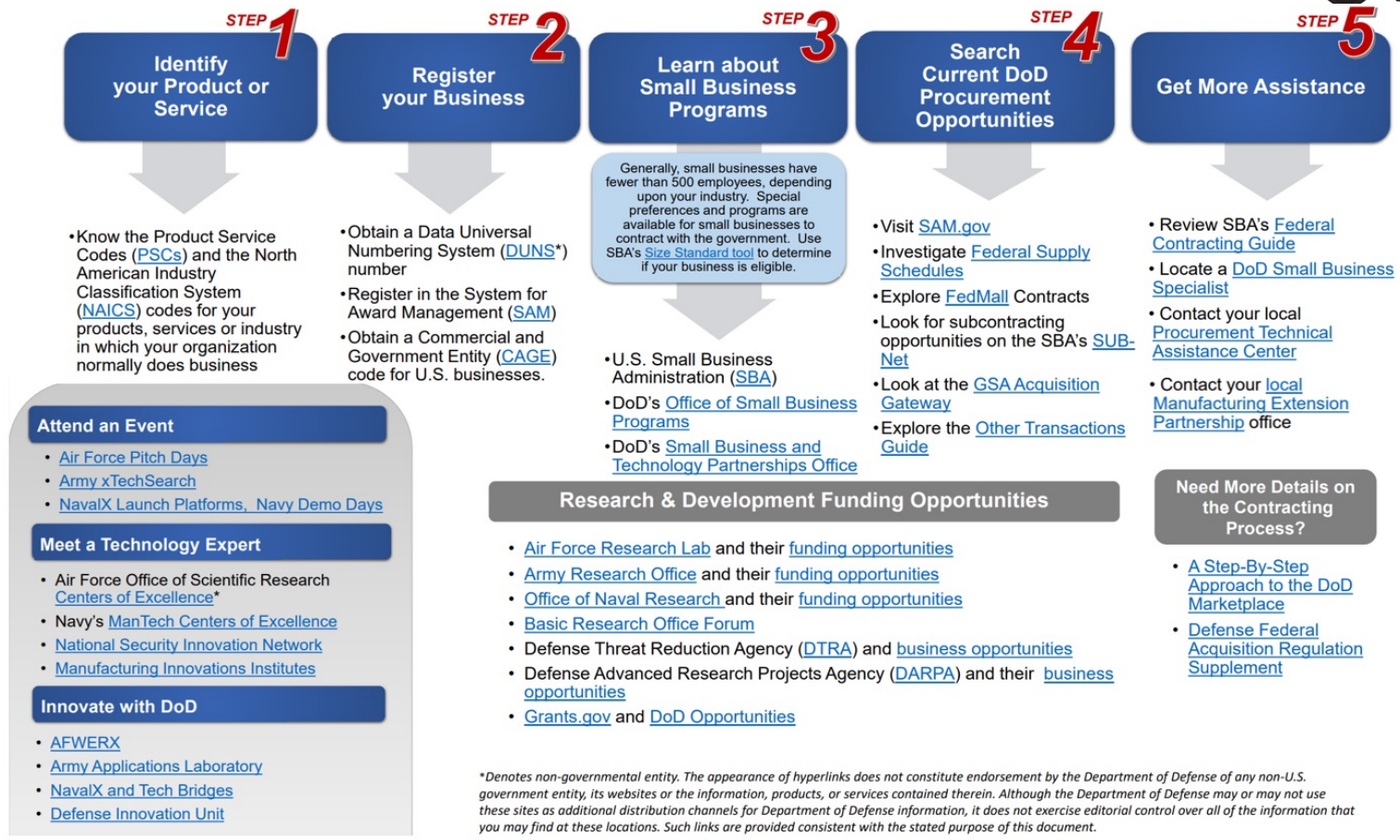
PROMOTE BENEFITS OF AM



- Cost - some applications may be cheaper to 3D print, especially for production runs.
- SWAP - Size, Weight, and Power can be optimized.
 - Topology, strength, heat exchange, etc.
- Unique Designs - Designs that can't be made traditionally.
 - Think internal curved fluidic passages inside a metal block that couldn't be machined out.
- Reduce Part Count - Combine multiple parts into one.
 - One 3D printed waveguide vs. five waveguides for a system.
- Reduced Time - Print parts when you need them as a stop-gap solution to improve readiness.
- Broader Industrial Base and Alternate solutions - Access to multiple options to meet unique & unexpected needs.

AM can help minimize supply chain & DMSMS issues

DOING BUSINESS WITH THE DOD



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www.businessdefense.gov/docs/resources/Doing-Business-with-DoD-Feb_2022.pdf

CONCLUSION



- DMSMS poses significant risk to sustainment of systems.
- This interdisciplinary problem offers opportunities to create an environment of solutions.
- Additive manufacturing introduces diversity and flexibility into DMSMS solutions.

Proactive DMSMS is the goal

OPEN DISCUSSION



Ask any questions you may have

APPROVED FOR PUBLIC RELEASE



APPENDIX

DMSMS RESOLUTIONS

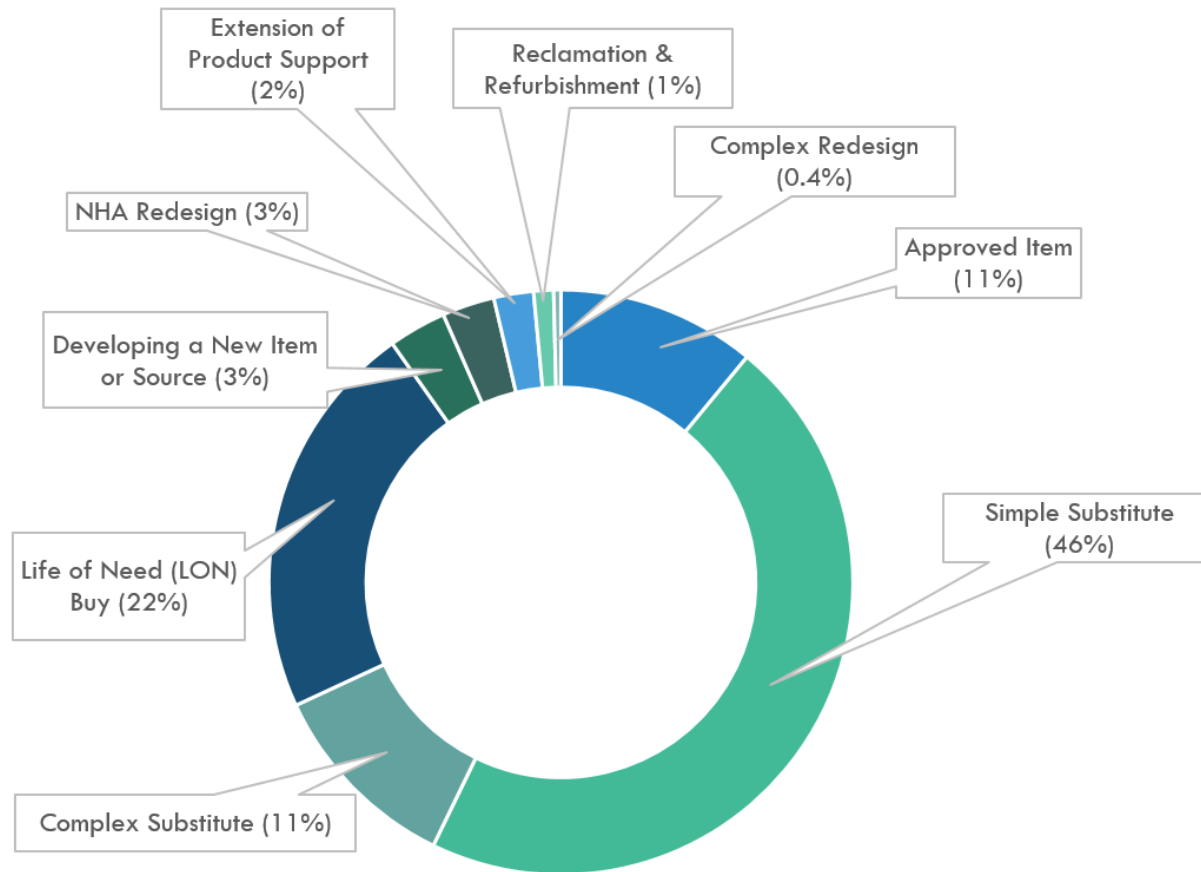


Overview

- 90% of solutions can be considered low cost (component sub + Life of Need (LON))
 - 68% are component substitutions
 - No LRU Mod
 - 11% are complex subs which may require systems qualification
 - 22% are LON
 - Not available with Reactive
 - Underutilized
- Avoid LRU redesigns and LRU Life of Type Buys (LOTB) with LON buys
- Proactive solutions don't impact Supply & Readiness

Percentages & costs per SD-22, January 2021

DMSMS RESOLUTIONS



Percentages per SD-22, January 2021

DMSMS RESOLUTIONS



Approved Item

- Use of an item already approved for use
 - Ex: A part already on a specification or source control drawing
- Does not require configuration management approval or a DMSMS Management Case
- Occurs 11% of the time & costs \$1,063 on average

Simple Substitute

- Replacement with an item that meets all requirements of the discontinued item, does not require modification to the NHA but has not yet been approved (aka Form/Fit/Function replacement)
- Typically require only minimal qualification
- Typically requires configuration management approval and establishment of DMSMS Management Case
- Occurs 46.3% of the time & costs \$3,760 on average

Percentages & costs per SD-22, January 2021

DMSMS RESOLUTIONS



Complex Substitute

- Replacement with an item that has different specifications, but does not require modification to the NHA (e.g., automotive grade vs MIL grade)
- Needs to be researched, analyzed & approved
- May require qualification at the subsystem or system level (e.g., Airworthiness)
- Requires configuration management approval and establishment of a DMSMS Management Case
- Occurs 10.9% of the time & costs \$17,653 on average

Percentages & costs per SD-22, January 2021

DMSMS RESOLUTIONS



Life of Need (LON) Buy

- Aka “Component” LON Buy
- Obtaining enough of the discontinued item to meet lifetime requirements
- “Lifetime requirements” defined as: to weapon system End of Life (EOL) or to a planned redesign (i.e., Bridge Buy)
- Some complexity in execution. Sole Source can be advantageous?
- Can also be used to the end of the contract, but this is an interim solution?
- Occurs 22.2% of the time & costs \$14,140 on average

Percentages & costs per SD-22, January 2021

DMSMS RESOLUTIONS



LRU Life of Type Buy (LOTB - not an accepted DMSMS solution)

- Procuring enough of the LRU to meet lifetime requirements
- We should avoid at all cost
 - Use Component LON buy instead
- Proactive DMSMS should eliminate almost all LRU LOTB's
- Proactive DMSMS should not be pursued for LRU's which have executed a LOTB
- See a simple example in the backup slides

Percentages & costs per SD-22, January 2021

DMSMS RESOLUTIONS



Developing a New Item or Source

- Developing a New Item or Source
- Developing and qualifying a new component or source
- Occurs 3.2% of the time & costs \$742,000 on average
 - New development - Emulation (e.g., DLA GEM program) offers lower cost (<\$200,000) options

NHA Redesign

- Redesigning the NHA (i.e., LRU or SRU)
- Occurs 2.9% of the time & costs \$1.338 Million on average

Percentages & costs per SD-22, January 2021

DMSMS RESOLUTIONS



Complex Redesign

- Redesign of a major subsystem
- Occurs 0.4% of the time & costs \$9-11 Million

Extension of Product Support

- Securing an extension to life cycle support contract
- Occurs 2.2% of the time & costs \$29,000
- Typically for commercial items and commercial software

Percentages & costs per SD-22, January 2021

DMSMS RESOLUTIONS



Reclamation & Refurbishment

- Removing needed parts from unserviceable assets & refurbishing them as required
- Most suitable for systems supported solely by repair
- Occurs 1.1% of the time & costs \$74,000

Percentages & costs per SD-22, January 2021