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Establishing a New Parts Management Oversight Paradigm (Conference Presentation)

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Establishing a New Parts Management Oversight Paradigm

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"This briefing is based entirely on material approved for public release."

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Scope

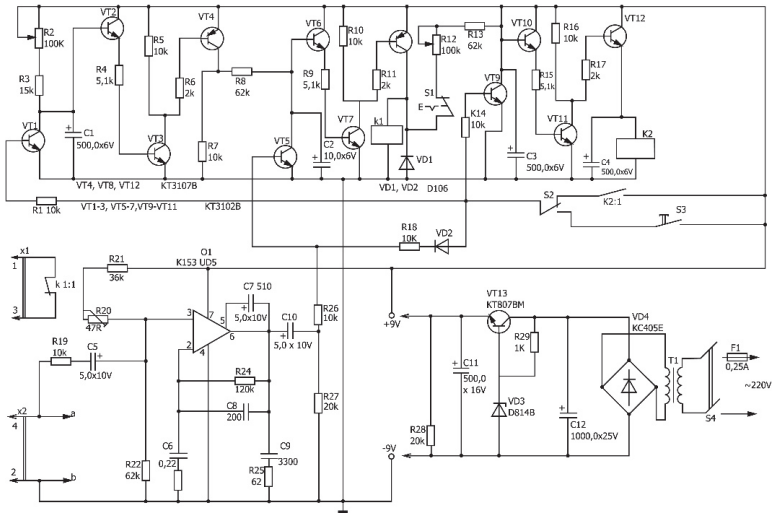
- **Concepts are designed to increase parts management discipline throughout the DoD**
  - **With some exception, most program offices exercise little parts management oversight**
  - **The new oversight practices**
    - **Represent a risk-based approach to parts management activities**
    - **Formulate a less rigorous version of the very disciplined activities carried out by organizations needing the most robust parts management oversight**
  - **See Standardization Document (SD)-19, *Parts Management Guide: A Guidebook of Best Practices for Oversight of Part Selection in Defense Systems,* and SD-26, *DMSMS* [Diminishing Manufacturing Sources and Material Shortages] *and Parts Management Contracting Guide,* for further information**

Outline

- **Introduction to the new parts management paradigm**
- **Initial risk assessment**
- **Type and level of program office oversight**
- **Subject matter expertise**
- **A program office Parts Management Plan**
- **Record keeping and metrics**

What is Parts Management?

Parts management is a *systems engineering discipline* for *selecting* and *assuring the performance* of parts and *assemblies* of parts, while accounting for the *materials and processes* used to manufacture them, throughout *all phases* of a system's (or equipment's) life cycle from initial design through disposal



What Are Parts Selection Considerations?

- **Part selection decisions are based on the thoughtful assessment and balancing of numerous, overlapping engineering design considerations including:**
  - ✓ Performance
  - ✓ Cost
  - ✓ Quality
  - ✓ Qualification
  - ✓ Reliability
  - ✓ Maintainability
  - ✓ Supportability
  - ✓ Standardization
  - ✓ DMSMS risk
  - ✓ Technology features and life cycle stage
  - ✓ Manufacturing processes and producibility
  - ✓ System security
  - ✓ Cyber weaknesses and vulnerabilities
  - ✓ Hardware and software assurance
  - ✓ Supply chain risk
  - ✓ Susceptibility to counterfeiting
  - ✓ Unauthorized tampering
  - ✓ Use of hazardous materials

- **The selection decision also varies as a function of criticality, the application of the part within the design, program duration, risk that the program office is willing to accept, and other factors**

An Updated Perspective on Parts Management Roles and Responsibilities

- **Contractor**
  - Selects parts
- **Government**
  - PERFORMS RISK-BASED OVERSIGHT OF CONTRACTOR PART SELECTIONS
  - Replaces unavailable parts during sustainment and conducts oversight thereof
  - Selects government furnished property (GFP) and parts for government designs, and conducts oversight thereof
  - Monitors for occurrences that affect the risk profile of a part or system (e.g., supplier part changes or supply chain changes), assesses the acceptability of risk changes, takes action where necessary, and conducts oversight thereof

An Updated Perspective on Parts Management Importance

- Applicable to several acquisition pathways
  - Urgent Capability Acquisition
  - Middle Tier of Acquisition
  - Major Capability Acquisition
  - Defense Business Systems

- Consequences of inadequate parts management
  - Improper parts utilization – insufficient derating, use of problematic parts
  - Poor performance – parts do not meet allocated requirements
  - Poor reliability
  - Increased DMSMS
  - Increased cost – unplanned rework, greater footprint
  - Reduced mission assurance
  - Overreliance on sole source
  - Higher likelihood of cyber exploitation
  - Higher likelihood of system compromise
  - Increased likelihood of supply chain disruptions – counterfeit, malicious tampering

Government's New Parts Management Oversight Paradigm (1 of 2)

The Vision

The *more disciplined* selection, procurement, and usage of parts on DoD systems to meet system requirements while balancing the costs and risks associated with the parts selection design considerations

Government's Oversight New Parts Management Paradigm (2 of 2)

Achieved By

- **Program offices following the practices in MIL-STD-11991, SD-19, and SD-26**
  - **Developing a program office Parts Management Program and Plan that take a risk-based approach to part selection oversight**
  - **Establishing part selection contract requirements based an appropriately tailored MIL-STD-11991 to meet the needs of the program office**
  - **Determining the level and extent of part selection verification and validation that will be performed by the program office**
  - **Defining, collecting, and analyzing records on parts selection oversight activities and their effect on cost, schedule, and performance**
  - **Monitoring data on changes to part selection design considerations and assessing whether risks associated with those changes warrant part or supplier adjustment**

Program Office Parts Management Program

- **Key elements**
  - **Make an initial assessment of the risks associated with parts selection, procurement, and use on the systems of interest in collaboration with other ongoing risk assessment activities**

  - **Determine the type and extent of oversight needed to reduce such risks to an acceptable level**
  - **Secure sufficient subject matter expertise to conduct that oversight**
  - **Develop, approve, and implement a risk-based program office Parts Management Plan based on the *risks* and *available* subject matter expertise**
- **Implemented by parts management integrated process team (IPT)**
  - **Representation from parts selection and integration organizations**
  - **Interfaces with other program office IPTs as needed**

Overview of a Program Office Parts Management Plan

- **Describes activities on how the program office will**
  - **Oversee contractor parts management activities and ultimately the parts selected during system design, production, and sustainment**
  - **Ensure sound parts selection, procurement, and usage when design or support/sustainment activities performed or provided organically by the government (where applicable)**
  - **Mitigate the risks associated with changes to the parts selected throughout a system's life cycle**
  - **Define, collect, and monitor parts management oversight performance records and metrics**

Outline

- Introduction to the new parts management paradigm
- **Initial risk assessment**
- Type and level of program office oversight
- Subject matter expertise
- A program office Parts Management Plan
- Record keeping and metrics

Program office Parts Management Program

Why Conduct an *Initial* Risk Assessment

- **Determine a basis for:**
  - **Tailoring the requirements of MIL-STD-11991 to the needs of the program office**
  - **Determining the level and extent of a program office's parts selection review and approval**
- ***Initial* because sufficient resources may not be made available**
- **It's not an independent activity, performed collaboratively with**
  - **Supply chain risk management**
  - **Ongoing safety, mission, programmatic … risk assessments**

Risk Determination and Aggregation

- Two approaches for determining high risk subsystems
  - Subject matter expert assessment utilizing PPP, other protection plans, and mission essentiality
  - Formal analysis using DoD's *Risk, Issue, and Opportunity Guidebook*
    - Identify and organize part selection risks and risk tolerances to be considered in a program office Parts Management Program
    - Classify the identified risks by likelihood and severity of consequence
    - Aggregate risks by subsystem
- Identify potential prioritized groupings of high risk parts that may need different degrees of oversight
  - Part criticality
  - Part complexity (e.g., application specific integrated circuits, microcontrollers, field programmable gate arrays)
  - Association with most critical missions

Outline

- Introduction to the new parts management paradigm
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Program office Parts Management Program

Options for Establishing Parts Selection Requirements

- No contractor Parts Management Plan required
- Require a contractor Parts Management Plan in accordance with the general requirements of MIL-STD-11991 tailored to the specific situation
- Require a contractor Parts Management Plan in accordance with the general and detailed requirements of MIL-STD-11991 tailored to the specific situation
- Supplement the manufacturing process requirements of MIL-STD-11991
- Supplement part requirements and prohibitions of MIL-STD-11991
- Replace MIL-STD-11991 under circumstances where more rigorous requirements are necessary

Increasing Rigor

Options for Program Office Review and Approval

- Verification of whether contractor is following the processes in its Plan
- Validation of the effectiveness of the contractor Parts Management Plan (i.e., the contractor's part selections)
  - Program office monitoring of contractor part selections
  - Assessing the viability of parts selected that do not meet program office preferences
  - Program office approval of parts
- Record keeping

Determining Type and Level of Oversight
Key Considerations

- Striking a balance between parts control and oversight based on risk
- Selecting the most important parts to concentrate on for validation
- The need for a contractor (and subcontractor) Parts Management Plan
  - Contractor must adhere to the processes in its Plan
  - Program office must have confidence that those processes will meet all of its requirements and assure that parts will meet all of their allocated requirements
- The need to monitor, benefits include:
  - Confidence in the parts that are used in DoD systems
  - Identification of contractor-chosen preferred parts not preferable to the program office
  - Negotiated part changes before design lock
  - Enhanced program office influence
  - Improved contractor parts selection
  - Improved efficiency when changes cannot be negotiated
  - Improved parts approval process
  - Discovery of problematic parts

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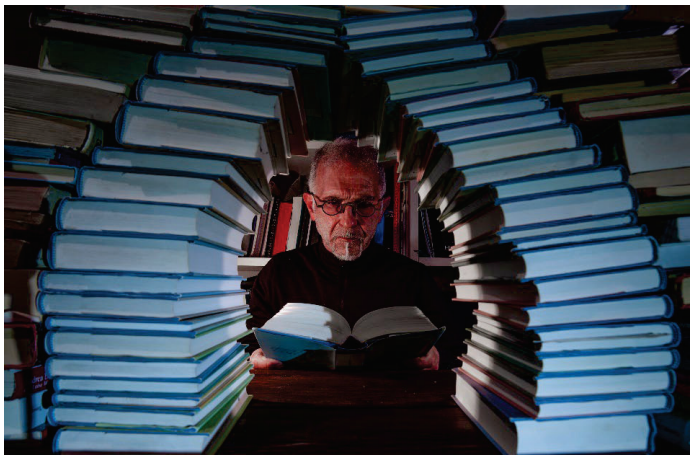
Program office Parts Management Program

Obtaining Subject Matter Expertise

- Specify the knowledge, skills, and abilities (KSAs) needed
  - Mechanical, electrical, and chemical engineering
  - Part construction and manufacturing processes
  - Assembly processes
  - Part manufacturer business practices and critical customers
  - Reliability, quality, and design engineering
  - Supply chain risk management (SCRM)
  - System security engineering (cyber)
- Determine the associated level of effort
  - Oversight activities
  - Number of (critical) parts
  - Life-cycle stage of system
- Secure access to the personnel who will provide the needed level of effort by KSA



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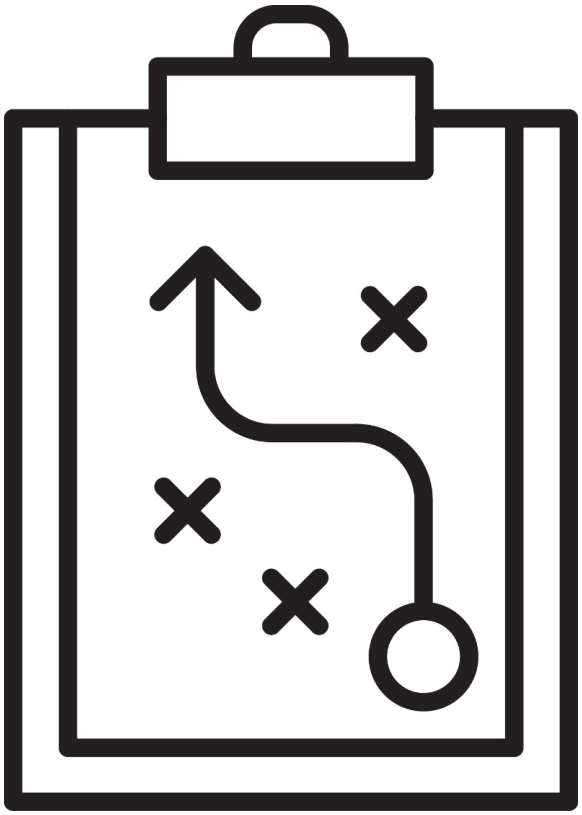
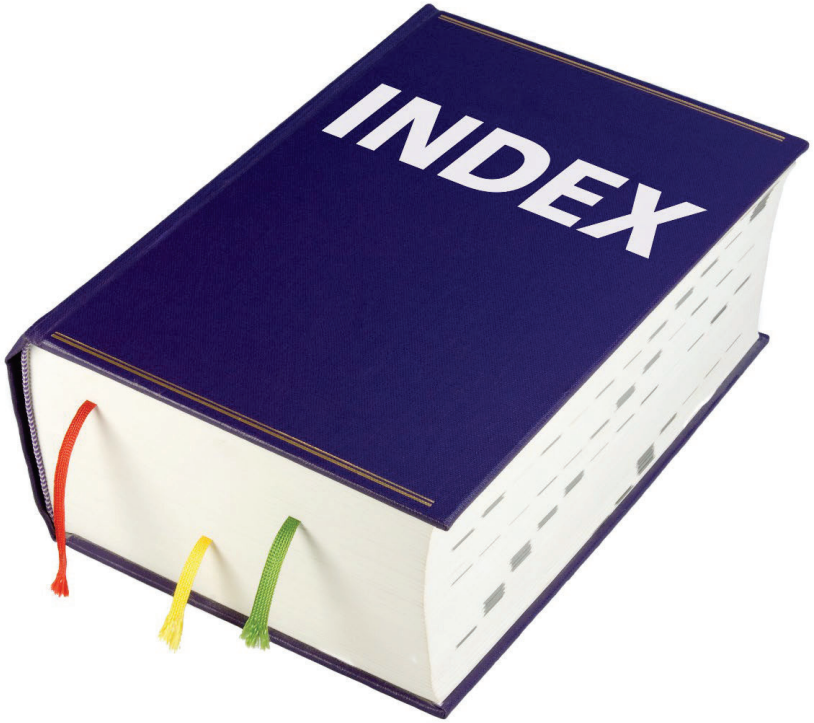
Program office Parts Management Program

Program Office Parts Management Plan (1 of 2)



- Documents all program office parts management oversight activities
- Approved by chief engineer, quality lead, or program manager
- Plan will differ by contractor
  - Oversight of a design/development contractor different than oversight of a maintenance contractor
  - All contractors could be combined into a single program office Plan
- Referenced in the technical tracking section of the Systems Engineering Plan

Program Office Parts Management Plan (2 of 2)

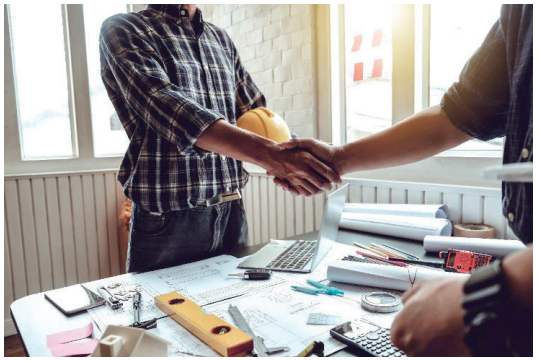


- **Content should include:**
  - Introduction and summary *(not discussed)*
  - Review and approval of contractor Parts Management Plan
  - Verification of whether the contractor is following its parts management processes
  - Validation of parts selected
  - Record keeping *(discussed in last section of brief)*
  - Review and approval of part selections by other government organizations *(not discussed)*
  - Continuous monitoring of part selections

Review and Approval of Processes in Contractor Parts Management Plan

- Define customer contractor interfaces
- Determine allocated and derived part requirements
- Identify restricted or prohibited part usage
- Qualify parts for use in the system
- Use suitable industry standard processes
- Define stress derating levels
- Assure COTS assemblies and GFE meet requirements
- Notify customer when not using authorized source
- Monitor failures to identify part issues
- Provide configuration control processes
- Flow down requirements to ***subcontractors***
- Other considerations for reviewing contractor Plan
  - Contractor lines of responsibility for the processes
  - Right to review and inspect data and references
  - Program office approval for Plan changes
  - Program office leverage

Technical requirement areas where the processes in the Plan should provide the program office with confidence that they are sufficiently rigorous in areas of highest program office concern i.e., parts meet their allocated requirements



Verification of Whether Contractor Following the Processes in its Plan

- Verification approaches (all require presence at contractor facilities)
  - Official program office audit
  - Address parts management during formal program office reviews
  - Request Defense Contract Management Agency (DCMA) surveillance
  - Embed engineers with the contractor
  - Informal site visits and other interactions

- Verification encompasses
  - A determination that parts management requirements are being contractually flowed down the supply chain correctly
  - An evaluation of the subtier vendors to ensure they are following the processes established in their Parts Management Plans

Validation of Contractor's Part Selections

- **Three aspects**
  - **Program office monitoring of contractor part selections to facilitate suggested part changes or processes for part rejection or part approval**
  - **Assessing the viability of parts selected that do not meet program office preferences leading to part rejection, suggested part changes, or expedited part approval processes *(exception reports)***
  - **Specific program office approval or rejection of parts**

Validation of Contractor's Part Selections
Program Office Monitoring of Contractor Part Selections (1 of 2)

- Oversight considerations
  - Two methods
    - Direct interaction during design
    - Review parts lists
  - Plus updates based on part changes
  - Determining whether parts meet allocated and derived requirements
    - Have the proper grade parts been selected? Is there an overuse of commercial grade parts? Should more military grade parts be used?
    - Have prohibited parts been selected?
    - Have all applications and operating environments been considered?
    - Is reliability sufficient?
    - Is the part shelf life adequate? Is the part nearing the end of its life cycle?
    - Have cyber security vulnerabilities been mitigated?
    - Are there opportunities for tampering or counterfeiting in the supply chain? Are lower tier vendors secure? Are there any unauthorized sources?

Validation of Contractor's Part Selections
Exception Reports

- **Exception reports**
  - **A list of selected parts where the contractor did not meet the program office's preference for parts with qualified alternates, parts with traceability to an authorized source, parts meeting the allocated system security engineering requirements, and genuine, unaltered parts**
  - **A description of why the part was chosen**
  - **An explanation of the risk mitigations put into place to address the risks associated with not meeting the preferences**
- **Oversight considerations**
  - **Rationale**
    - **Inform the contractor of program office interests**
    - **Enable the program office to reject parts that do not meet its preferences**
    - **Highlight areas of attention for monitoring and parts approval**

Validation of Contractor's Part Selections
Program Office Approval of Parts

- **Examples of minimal requirements**
  - Part use outside vendor specifications other than in accordance with the criteria in Appendix A of MIL-STD-11991
  - Use of any prohibited parts, materials, and processes from MIL-STD-11991, Appendix C
  - Use of any non-conforming parts without program office approval
  - Use of application specific integrated circuits system not procured from a Defense Microelectronics Activity accredited trusted supplier IAW DoDI 5200.44
- **Oversight considerations**
  - Use of a program office-approved PPL
  - Formal process with a parts control board or equivalent
  - Informal processes
    - Done with working group or IPT
    - Exception reports
    - Based on a Technology Readiness Review or a Production Readiness Review
  - Data needs should be established

Continuous Monitoring of Part Selections

- Risk may change during production and sustainment
- Triggering event is occurrence that changes risk profile of a system or parts within a system at any point in the life cycle; examples include
  - Introduction of new maintenance equipment
  - Obsolescence
  - New regulations
  - Discovery of a new cyber weakness or vulnerability
  - Change in supplier's ownership

Outline

- Introduction to the new parts management paradigm
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- **Record keeping and metrics**

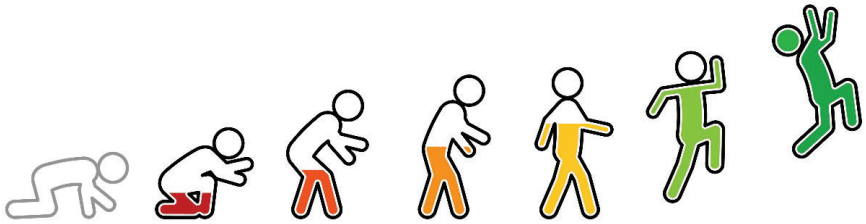
Program office parts management program

Introduction

- Benefits of parts management record keeping to both program offices and higher level organizations
  - Justifying additional parts management resources
  - Improved parts management efficiency
  - Reduced systematic DoD risks
  - Monitoring parts management trends
  - Measuring the effects of disciplined parts management
  - Improved program office-contractor relations
- Record keeping vs metrics
  - Data elements to be collected
  - Analysis and manipulation of the data elements

Approach

- Potential value is clear
- Lack of experience implies uncertainties
  - How to attain value
  - Level of effort to attain value
  - Ease of data collection and maintenance



therefore

- Suggest defining useful metrics to analyze irrespective of how they will be used
  - Innumerable possible uses of records, and the need for particular records is not always known in advance
- Illustrate potential benefits through examples
  - Examples range from straightforward metrics that can be computed with records, to broad empirical studies

There is a section in the program office Parts Management Plan on defining, collecting, and monitoring data and then analyzing metrics

Types of Records

- **Three types of records to guide practitioners in determining what to collect**
  - **System and Contract Records**
    - These describe the system being developed and the contract used to select parts
    - System and contract records provide needed context to make the other two types of records more useful
  - **Parts Records**
    - These describe the actual parts selected for a system, and include both aggregates and part-specific records
    - Focus is on records associated with parts management (e.g., whether a part requires program office review/approval), but conventional parts info is included as well (e.g., mean time between failures (MTBF), temperature ranges)
  - **Practices Records**
    - These describe the parts management practices used to select parts and provide oversight during the selection process

Additional Record Keeping Considerations

- Example records provided are further categorized as basic, intermediate, or advanced
  - Parts management records keeping is immature, and the costs and logistics of collecting may create challenges
  - Basic records provide a starting point for program offices with no/minimal prior record keeping
- When records are collected
  - The vast majority of provided examples can be collected during the part selection process. Program offices expectations for contractor's delivery of records should be specified in the contract.
- Who collects records
  - Program offices may delegate records collection to contractors. In some cases, they may choose to collect and/or verify data themselves.
- With no data dictionary, for now, narrative descriptions of the data elements are recommended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13. SUPPLEMENTARY NOTES

14. ABSTRACT

This briefing describes a new parts management oversight paradigm for DoD that includes more disciplined selection, procurement, and usage of parts on DOD systems to meet system requirements while balancing the costs and risks associated with the parts selection design considerations. The paradigm includes:

- A risk assessment to determine the type and level of program office oversight to be performed;
- Program office approval of a contractor Parts Management Plan that meets the tailored requirements of a Parts, Materials, and Processes MIL-STD or its equivalent;
- Program office verification that the contractor is following the processes in its Plan;
- Program office validation that the parts selected are effective and meet their requirements; and
- Program office development of its own Parts Management Plan that lays out the activities it will perform associated with the above four bullets.

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