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Overview of SAE's AS6500 "*Manufacturing Management Program*"

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Outline

- Background
- Objectives
- Requirements
- Implementation
- Benefits
- Summary

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Background

- **DoD Issues: Weapon systems performance shortfalls, cost overruns, supplier quality escapes, production transition problems, negative GAO reports, etc.**

- **ASC/ENSM conducted a 360 Degree study of manufacturing and quality problems**
  - **Included: customers, peers, industry (commercial and aerospace)**
  - **Industry's message: The Air Force does not:**
    - **Specify the right deliverables in their contracts**
    - **Use the right metrics to measure performance**
    - **Specify proper MFG/QA contractual requirements in contracts**
    - **Focus on the right parameters for PRRs**

Acquisition reform eliminated the military standard for manufacturing management

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Background

- OSD formed Gap Analysis Working Groups (2011) to evaluate standardization gaps and potential solutions in several functional areas, including Manufacturing
- Recommendation for a manufacturing standard was briefed to Defense Standardization Council (DSC)
  - Need based on Mfg/QA root causes of problems in weapon system acquisition
  - Quality area was deemed to have sufficient coverage by commercial standards
- DSC agreed with recommendations
  - OSD clarified direction in summer 2012: All teams are to develop commercial standards
- OSD issued direction to establish a Manufacturing Standard Working Group (Dec 2012)
- In Sep 2013, Working Group selected/recommended to OSD SAE International to develop the manufacturing management standard

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Background

SAE created new G-23 Manufacturing Management Committee

Chair: US Air Force
Vice-Chair: NCAT
Secretary: US Air Force
SAE: Technical Project Specialist

DoD Members

- Army
- Navy
- Air Force
- OSD
- DCMA
- DAU

Industry Members

- Boeing
- Lockheed Martin
- BAE
- Raytheon
- Northrop Grumman
- GE Aviation
- Coordination with numerous industry organizations

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Objectives of the Standard

- **Documented best manufacturing management practices aimed at promoting the *timely* development, production, modification, fielding, and sustainment of *affordable* and *capable* products**

- **Provide maximum flexibility and tailorability in application by a diverse contractor community**

- **Non-prescriptive (top level requirements only) – allow flexibility to use existing company processes**

- **To provide clear contractual requirements for use by both government and industry**

AS6500 Integration with Other SAE Standards

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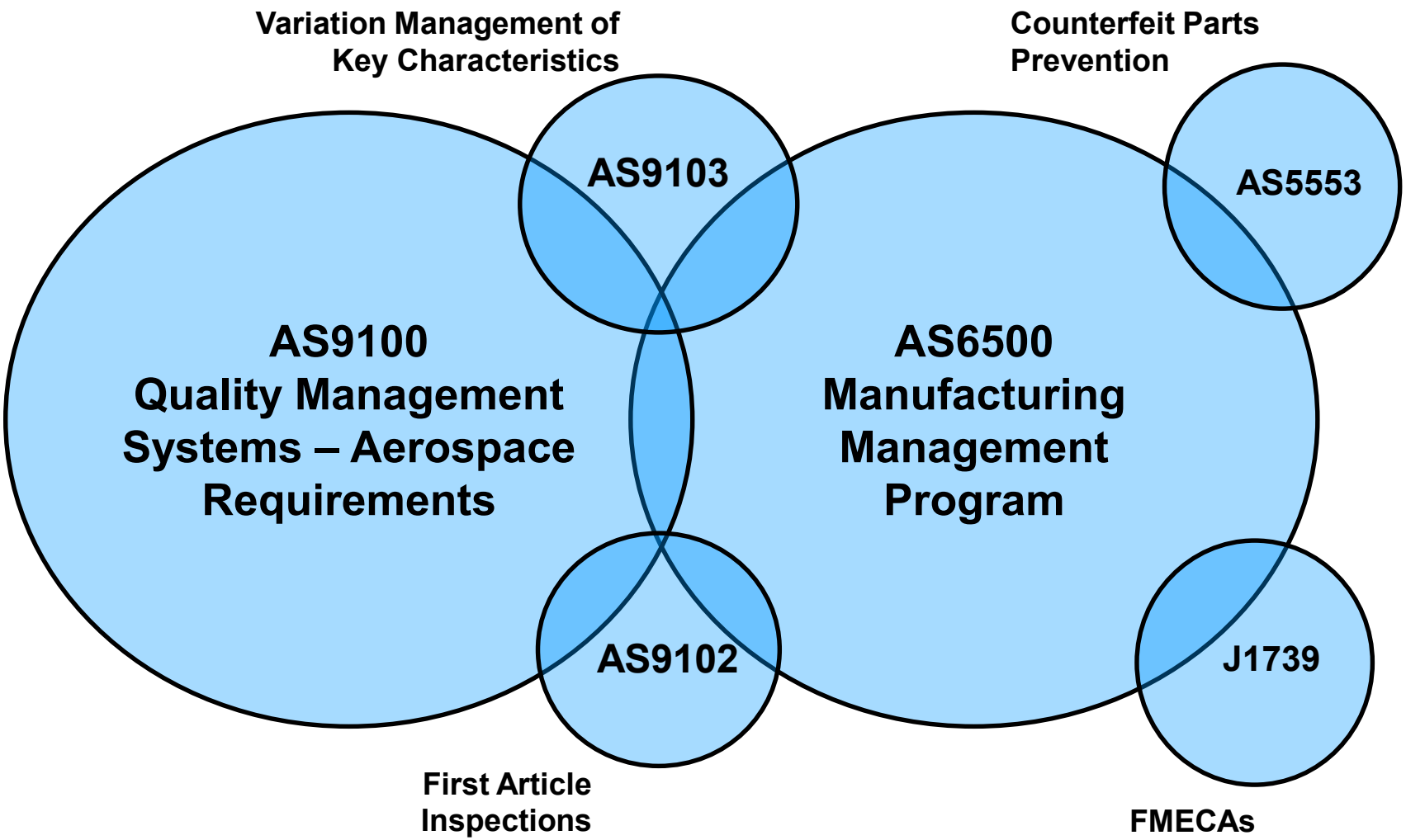

AS6500 and AS9100: Companion documents

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Definitions

- The standard provides common definitions for 36 manufacturing-related terms with sources identified
  - DoD
  - Commercial
  - Mixture
- Definitions represent consensus agreements between government and industry
  - Consistency across programs, services, and companies

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Requirements
Overview of Content

Manufacturing Management System:
Program, Policies, Objectives

Manufacturing planning

- Manufacturing Plan
- Supply chain, materiel management
- Manufacturing technology
- Cost
- M&S
- System Verification
- Workforce
- Tooling/Test Equipment/Facilities

Design analysis for manufacturing

- Producibility analysis
- Key Characteristics
- Process FMEAs

Manufacturing operations management

- Scheduling & control
- Surveillance
- Continuous Improvement
- Process control plans
- Process capabilities
- Production Process Verification
- FAIs / FATs
- Supplier Management
- Supplier Quality

Manufacturing Risk Identification

- Feasibility assessments, MRLs, PRRs

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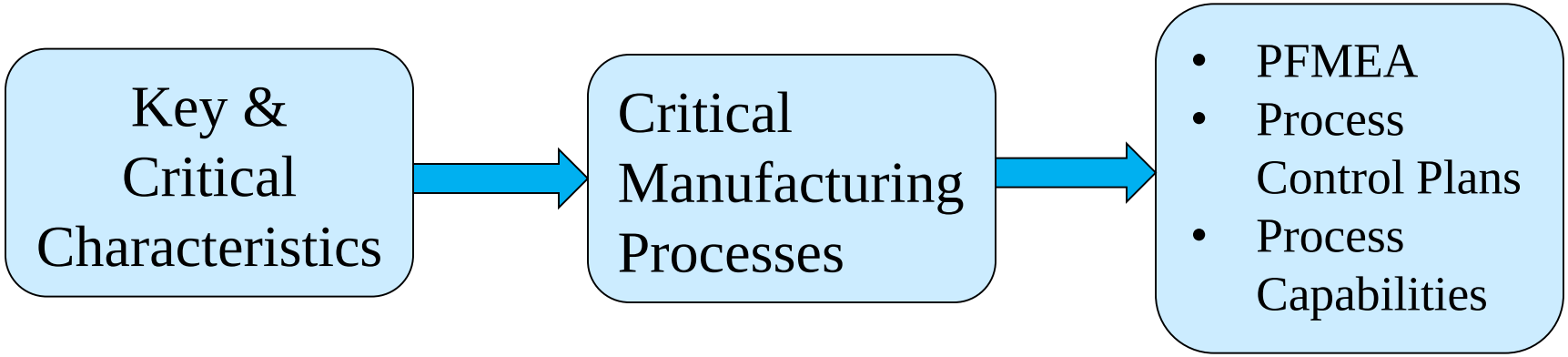
Manufacturing Design Analysis

- **Producibility Analysis**
  - **Selection: Procedures and criteria for candidate selection during cost and trade studies**
  - **Analysis: identify drivers and potential initiatives**
  - **Trade studies shall include: production process capabilities, manufacturing costs, special tooling, special test equipment, long lead material, capacity, special training, and schedule impacts**
  - **Decision criteria: Implementation of process for prioritizing, approval, and monitoring implemented projects**
  - **Reporting: assessment of status, analysis, and issues**

Manufacturing Design Analysis

- **Key Characteristics (KC)**
  - **Identify KCs in technical data package**
  - **Add or delete KC due to engineering changes**
  - **Identify critical manufacturing processes for each KC**
  - **Develop process control plans for critical manufacturing processes**
  - **Flow down to suppliers**



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Manufacturing Design Analysis

- **Process Failure Modes Effects Analysis (PFMEA)**
  - Identify failure modes in critical manufacturing processes
  - Identify actions to prevent or mitigate the failures
  - Perform prior to PDR and updated by CDR
  - Updated with engineering or significant process changes
  - Reference: SAE J1739

Process	Failure Mode	Failure Effects	Causes	Preventive Action

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Manufacturing Risk Identification

Manufacturing risk management activities shall be integrated into program risk management process

Elements

- **Manufacturing Feasibility Assessments**
- **Manufacturing Readiness Level Assessments**
- **Production Readiness Reviews**

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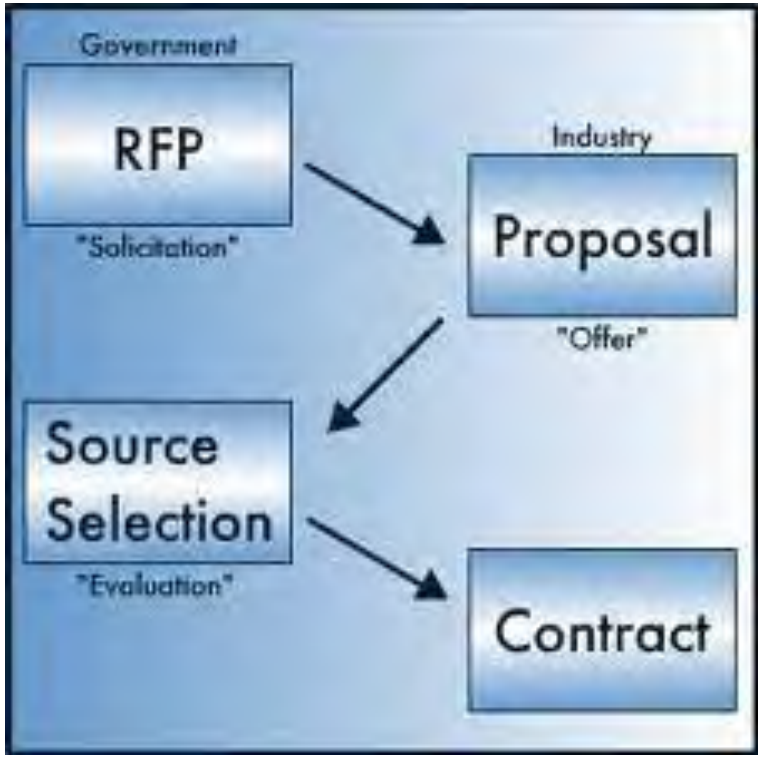
Implementation
Policy Requirements

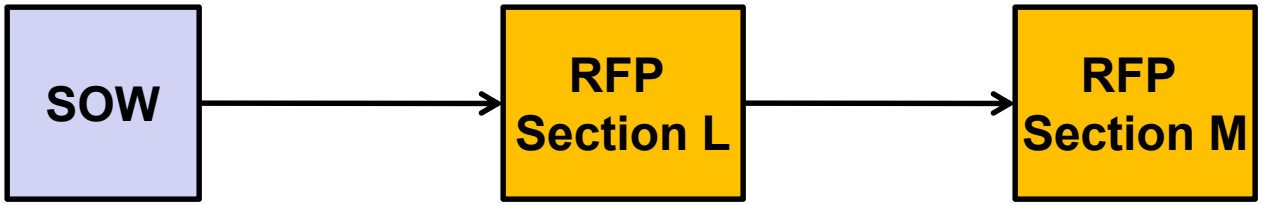
- **DRAFT Air Force Instruction 63-145 Manufacturing and Quality Management (Strong support from SAF/AQ):**

  A.3.1 ". . . IAW paragraph 4.2, the program office addresses the following manufacturing and quality management requirements in all contracts or provides a rationale in the SEP for why the requirement does not apply."

  Section A.3.1.1 "Manufacturing Management System" For programs with a manufacturing component, require contractors to have a manufacturing management system. To meet this requirement, ACAT I programs shall include AS6500 in contracts. Additionally,AS6500 is the preferred approach for programs in other ACATs.

Implementation
Contracting – Source Selection





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Implementation
Example RFP Language

Statement Of Work (SOW):

"The contractor's Manufacturing Management Program shall meet the requirements of AS6500."

Section L: Instructions to Offeror's

"The offeror shall describe how their manufacturing management system meets the requirements of AS6500."

Section M: Evaluation Criteria

"This subfactor is met when the offeror's proposal…Describes how their manufacturing management system meets the requirements of AS6500."

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Implementation
Tailoring

- **AS6500 is intended for all phases and all programs with manufacturing content; however, tailoring for your specific program is encouraged**
- **A table of typical situations is available to be used as a guide (not an absolute solution)**
- **A description of tailoring may be called out in the SOW and included as an attachment to the contract**

Excerpt of tailoring guide

REQUIREMENT	MSA	TMR R	EMD	Production	Sustainment	Commercial Derivative	Built to Print
5.2 Design Analysis for Manufacturing	Y	Y	Y	Y	As needed	Y	Y
5.2.1 Producibility Analysis	Y	Y	Y	Y	As needed	Y	N
5.2.2 Design Trade Studies	Y	Y	Y	N	As needed	Y	N
5.2.3 Key Characteristics	N	Y	Y	Y	As needed	Y	As needed

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Implementation
Oversight

- Program Office should monitor compliance through manufacturing and quality reviews and day-to-day communications with contractor counterparts
- DCMA can monitor implementation and compliance at primes and suppliers
- Consider requiring the delivery of related manufacturing metrics and/or a manufacturing plan
  - Contractor format is acceptable
  - Work with your Configuration and Data Manager to select appropriate Data Item Descriptions for technical reports and to develop the CDRL(s)

No intent to have certification or registration process

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Benefits

- **A Manufacturing Management standard will benefit both DoD and Industry:**
  - **Provides a vehicle to contractually communicate manufacturing requirements**
  - **Promotes more consistent customer requirements**
  - **Puts all offerors on the same playing field during competitive purchases**
  - **Better enables contractors to implement best manufacturing practices by providing a customer requirement against which to budget**
- **Supports DoD's Better Buying Power (BBP) initiative**
  - **BBP Tenets: Affordability & Productivity**
  - **AS6500: Producibility, Production Cost Estimates, Continuous Improvement, etc.**
- **More consistent application of best practices will result in reduced costs, higher schedule confidence, and more robust products**

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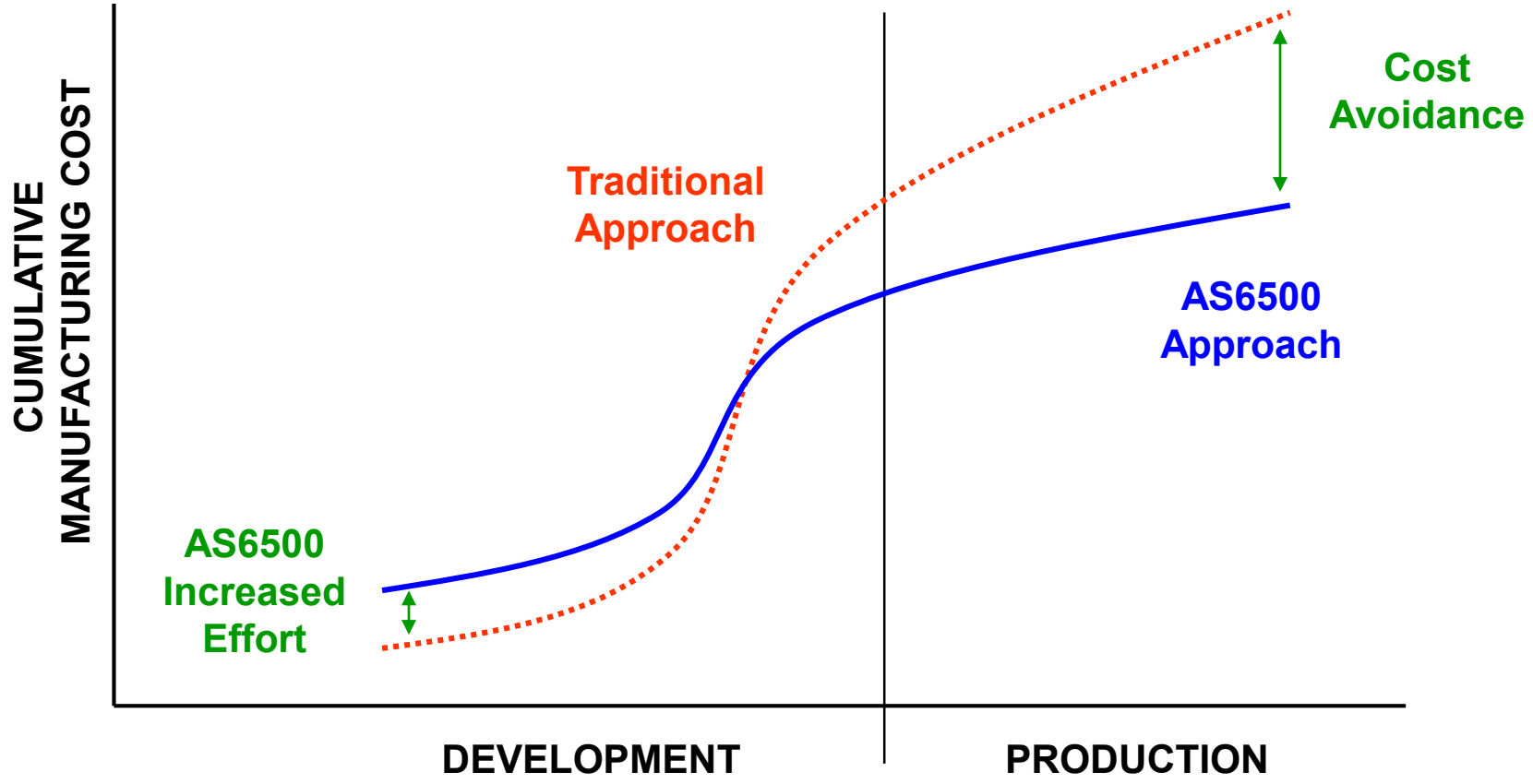
Benefits (Notional)

AS6500 Savings



AS6500 implementation will reduce program life cycle costs

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Summary

- **AS6500 is the companion document to AS9100**
- **Applicable to all programs and all phases where there is manufacturing content; tailoring is encouraged as needed**
- **AS6500 documents proven manufacturing management practices that will result in improved cost, schedule, and quality performance and more robust and reliable products for our customers**