PERFORMING PRODUCT SUPPORT ANALYSIS:
TA-STD-0017 ANALYSIS & DOCUMENTATION

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CLEP Professional Development Event

Presented by:
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SESSION PRESENTER

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25+ years of Logistics Engineering Experience

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NAVSEA Certified RCM Developer, Level I & II

Business Director, Acquisition Logistics Engineering (ALE)

CLEP VP of Programs
AGENDA

- PSA Background & Objectives
- Activity 1 – Product Support Strategy
- Activity 2 – Product Support Planning
- Activity 3 – Program and Design Reviews
- Activity 4 – Application Assessment
- Activity 5 – Support System Standardization
- Activity 6 – Comparative Analysis
- Activity 7 – Technological Opportunities
- Activity 8 – Supportability and Supportability Related Design Factors
- Activity 9 – Functional Requirements
- Activity 10 – Support System Alternatives
AGENDA (CONT.)

- Activity 11 – Evaluation of Alternatives and Tradeoff Analysis
- Activity 12 – Task Analysis
- Activity 13 – Early Distribution Analysis
- Activity 14 – DMSMS – Obsolescence System Support
- Activity 15 – Field Feedback
- Activity 16 – Disposal Analysis
- Activity 17 – Operational Suitability Test, Evaluation, Verification, & Validation
- Utilization of an LPD Database
- LPD Software Tools
INTRODUCTION

BACKGROUND:

- Why is PSA an important part of development?
- When is it appropriate?
- Is it too early/late to do it?
- How do we analyze something that doesn’t exist yet?
- What are the expected outputs from the PSA effort?
  - Insights to $ and $o Drivers
  - Design-to Criteria
  - Inputs to Tradeoff Studies
PRODUCT SUPPORT ANALYSIS

- PSA is a wide range of analyses that are conducted within the systems engineering process including:
  - Failure Modes, Effects and Criticality Analysis (FMECA)
  - Fault Tree Analysis (FTA)
  - Reliability Centered Maintenance (RCM) Analysis
  - Level of Repair Analysis (LORA)
  - Maintenance Task Analysis (MTA)
  - And others...

- The goal of PSA is to ensure that supportability is included as a system performance requirement.

- It should be planned, integrated, developed, and conducted in conjunction with other requirement definition, design, development, production, and deployment functions to cost effectively achieve overall program objectives.

- Is consistent with the type and phase of the acquisition program (tailoring).
**PSA OBJECTIVES**

*Provide a single, unified approach by the military services to:*

- Cause supportability requirements to be an integral part of system requirements and design
- Define support requirements that are optimal with design and each other
- Define support required during operational phase
PSA GUIDANCE

SAE TA-STD-0017

“This standard defines the analysis required to define the support system for new products, systems and end items. SAE TA-STD-0017 is a new and improved replacement for the cancelled MIL-STD-1388-1A. The application of TA-STD-0017 is recommended for DoD Programs by tailoring the Statement of Work (SOW) to reflect Section 813 (FY13 NDAA) and Better Buying Power 2.0 requirements and using MIL-HDBK-502A guidance for defining which activities are included in the Statement of Work (SOW).”
INTEGRAL PART OF SYSTEMS ENGINEERING

I. INPUT REQUIREMENTS
   - Activity 4 - Application Assessment
   - Activity 6 - Comparative Analysis

II. FUNCTIONAL ANALYSIS
   - Activity 7 - Technological Opportunities
   - Activity 9 - Functional Requirements
   - Activity 10 - Support System Alternatives

III. SYNTHESIS
   - Activity 5 - Support System Standardization

IV. EVALUATION & DECISION
   - Activity 11 - Evaluation of Alternatives & Trade-off Analysis
   - Activity 8 - Supportability & Supportability Related Design Factors

V. DESCRIPTION OF SYSTEM ELEMENTS
   - Activity 8 - Supportability & Supportability Related Design Factors
   - Activity 15 - Field Feedback
   - Activity 17 - Operational Suitability Test, Evaluation, Verification & Validation
PRODUCT SUPPORT ANALYSIS PROCESS

First Article (LRIP)
- Hardware Requirements Specifications
- System / Subsystem Design Descriptions

CDRLs
Comparative Analysis
Support System Standardization
Technological Opportunities
Design/Support Tradeoffs
Resource Support Tradeoffs
Manpower/Personnel Tradeoffs
Training Tradeoffs

ID Supportability Drivers
1 2 3 4 5

Use Study
(Activity 4)

New System
- Design Concepts
- Requirements

Design Influences
(Activity 11)

Trade Off Analysis

Perform SA on BCS
(Activity 6)

Develop BCS (O&S S)
(Activity 6)

Gather BCS Candidate Data

Define Level of Detail for Analysis Environment

Existing Customer Infrastructure
- Mission Profile

Existing Similar System
- Cost & Reliability
- Lessons Learned

Tradeoff Topics/Indenture Level

Prelim Material Solution

Maintainability Analysis

Reliability Analysis

Common Source Logistics Database (PowerLOGJ)

Output Reports
- LSA 024 (Maint Plan)
- LSA 039 (Provisioning)
- LSA 019 (Task Analysis)
- LSA 004 (MAC)

Maintenance Tasks

Failure Modes Failure Rates

Manpower/Personnel
Standardization
Support System Alternatives
Technology Opportunities
Training
System Safety
HFE
Soldier Survivability
Disposal
ACTIVITY 1 – PRODUCT SUPPORT STRATEGY

1.1 • Develop Potential Supportability Objectives

1.2 • Identify Cost Drivers

1.3 • Update Product Support Strategy

To develop a proposed PSA strategy for use early in an acquisition program, and identify PSA activities which provide the best return on investment and document the risks of accomplishing those objectives.

MIL-STD-1388-1A, Task 101
ACTIVITY 2 – PRODUCT SUPPORT PLANNING

2.1 • Product Support Plan

2.2 • Product Support Plan Update

- Develop a plan that identifies and integrates all PSA activities, management responsibilities and activities, and outlines the approach for accomplishment.

*MIL-STD-1388-1A, Task 102*
ACTIVITY 3 – PROGRAM AND DESIGN REVIEWS

3.1 • Design Review Procedures

3.2 • Design Review

3.3 • Supportability & Supportability Related Design Reviews

3.4 • PSA Technical Interchange Meetings

Establish plan for design and PSA reviews

MIL-STD-1388-1A, Task 103
ACTIVITY 4 – APPLICATION ASSESSMENT

4.1 • Intended Use/Capabilities

4.2 • Quantitative Factors

4.3 • Field Visits

4.4 • Intended Use/Capabilities Report

- To identify support factors related to the system’s intended use
- MIL-STD-1388-1A called this a “Use Study”

*MIL-STD-1388-1A, Task 201*
ACTIVITY 5 – SUPPORT SYSTEM STANDARDIZATION

5.1 • Support Standardization Constraints

5.2 • Standardization Costs

5.3 • Hardware/Software Standardization Approaches

5.4 • Standardization Risks

- Define system use in support terms for standardization efforts

MIL-STD-1388-1A, Task 202
SUPPORT SYSTEM STANDARDIZATION

- Support System Standardization Analysis and Report
  - Develop Support System Standardization implementation process
  - Identified standardization opportunities in existing or planned product support resources
  - Defined supportability design constraints imposed for standardization
    - Established “design-to” criteria in Program Requirements tracking (DOORS)
    - Analyzed preliminary designs for compliance
ACTIVITY 6 - COMPARATIVE ANALYSIS

- Define analytical foundation for projecting system parameters and targets for improvement.

- Identify Existing Products
- Baseline Comparative System (BCS)
- BCS Logistics Requirements
- BCS Qualitative Constraints
- BCS Drivers
- Identify Subsystems with No BCS
- BCS Updates
- BCS Risks

MIL-STD-1388-1A, Task 203
BASELINE COMPARATIVE SYSTEM (BCS)

- Identification of the system functions and interfaces being demonstrated in current customer operations
  - Selection of Representative System (RS) candidates
  - Comparable in complexity, application, and usage
- Build Baseline Comparative System (BCS) for system
- Define supportability, cost ($), and readiness (Ao) metrics
- Create model that projects key program metrics
- Gather info on current logistics parameters (Rel, Maint, etc)
- Model current support arrangement
- Adjust hardware definition and performance parameters to reflect new system
- Perform and document Use Study
- Tailor support system arrangement / performance
- Establish baseline for future trade-off studies
ACTIVITY 7 – TECHNOLOGICAL OPPORTUNITIES

- Identify Potential Technology
- Update Design Objectives
- Technology Risks

- Identify and evaluate opportunities for application of new technology to design and supportability requirements

*MIL-STD-1388-1A, Task 204*
TECHNOLOGICAL OPPORTUNITIES

- New technologies as applied to both system solution and support system
  - Material Solution examples having Supportability impacts:
    - Additive Manufacturing (3D Printing)
    - Advanced materials - alloys and composites
    - Digital electronic controllers
    - Enhanced prognostics and health monitoring; Digital Twin
    - Others?
  - Support System examples:
    - RFID for asset management
    - Intelligent tutoring systems
    - Augmented reality (glasses)
    - Others?
ACTIVITY 8 – SUPPORTABILITY & SUPPORTABILITY RELATED DESIGN FACTORS

8.1 Operations & Support Capabilities

8.2 Sensitivity Analysis

8.3 Data Rights

8.4 Capability Risks

8.5 Key Performance Parameters

8.6 Market Limitations

8.7 Update Key Performance Parameters

- Quantitative supportability characteristics
- Define supportability-related design objectives, goals, thresholds, and constraints (i.e. Operational Availability ($A_o$), Mean Time Between Failures (MTBF), Mean Time to Repair (MTTR), spares and logistic delay times, diagnostics effectiveness)

MIL-STD-1388-1A, Task 205
### ACTIVITY 9 – FUNCTIONAL REQUIREMENTS

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<thead>
<tr>
<th>Section</th>
<th>Description</th>
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<tbody>
<tr>
<td>9.1</td>
<td>Identify Functions</td>
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<td>9.2</td>
<td>Unique Item Functions</td>
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<td>9.3</td>
<td>Function Drivers</td>
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<td>9.4</td>
<td>Function Risks</td>
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<td>9.5</td>
<td>Failure Mode, Effects, and Criticality Analysis (FMECA)</td>
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<td>9.6</td>
<td>Fault Tree Analysis (FTA)</td>
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<td>9.7</td>
<td>Reliability Centered Maintenance (RCM) Analysis</td>
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<td>9.8</td>
<td>Task Inventory</td>
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<td>9.9</td>
<td>Design Alternatives</td>
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<td>9.10</td>
<td>Function Updates</td>
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- Identify operations and support functions for each alternative (tasks required)
ACTIVITY 10 – SUPPORT SYSTEM ALTERNATIVES

10.1 • Support Alternatives

10.2 • Update Support Alternatives

10.3 • Viable Support Plan

10.4 • Update Viable Support Plan

10.5 • Support Plan Risks

- Establish viable support system alternatives for evaluation and determination of the best system for development.

MIL-STD-1388-1A, Task 302
ACTIVITY 11-

11.1 Tradeoff Analysis
11.2 New/Critical Support Tradeoffs
11.3 Design/Support Tradeoffs
11.4 Sensitivity of Support Tradeoffs
11.5 Manpower/Personnel Tradeoffs
11.6 Job/Duty Tradeoffs
11.7 Level of Repair Analysis (LORA)
11.8 Diagnostic Tradeoffs
11.9 BCS/New Product Tradeoffs
11.10 Energy Tradeoffs
11.11 Damage/Repair Tradeoffs
11.12 Transportability Tradeoffs
11.13 Facility Tradeoffs

EVALUATION OF ALTERNATIVES & TRADEOFF ANALYSIS

- Determine the preferred support system alternative(s)
- Meet the system performance objectives with the best balance between cost, schedule, readiness, and supportability

*MIL-STD-1388-1A, Task 303*
### CONTRIBUTING TO TRADEOFF ANALYSIS

- Make meaningful Supportability inputs to Program Design tradeoffs

**Program Supportability Trade-Off Assessment**

<table>
<thead>
<tr>
<th>Trade Off Name / Title:</th>
<th>Supportability Analyst:</th>
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**BASELINE:**

**DESCRIPTION OF ALTERNATIVES:**

**ASSUMPTIONS:**

**CONCLUSIONS/RECOMMENDATIONS:**

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**QUALITATIVE ASSESSMENT OF IMPACTS**

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<thead>
<tr>
<th>COST, WEIGHT, PERFORMANCE IMPACTS:</th>
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<th>UNAVAILABILITY/DOWNTIME IMPACTS:</th>
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<th>HUMAN FACTORS / SAFETY IMPACTS:</th>
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<th>SUPPORT SYSTEM IMPACTS:</th>
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**Product Support Management**

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<th>Design Influence</th>
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ACTIVITY 12 - TASK ANALYSIS (SUBTASKS)

- Analyze required operations, support and maintenance tasks
- Document logistic support resources required for all tasks

MIL-STD-1388-1A, Task 401
ACTIVITY 13 – EARLY DISTRIBUTION ANALYSIS

13.1 • New Product Impacts
- Identify sources of manpower and personnel
- Evaluate potential logistic shortfalls
- Assess impact of new system on existing systems

13.2 • Impacts on Manpower

13.3 • Readiness Impacts

13.4 • Survivability Analysis

13.5 • Impact Solutions

*MIL-STD-1388-1A, Task 402*
ACTIVITY 14 – DMSMS - OBSOLESCENCE
SYSTEM SUPPORT

14.1

- DMSMS/Obsolescence
- Develop Alternatives
- Evaluate potential support issues

- Diminishing Manufacturing Sources & Material Shortages Management (DMSMS)
- Ensure that adequate support resources will be available over product life
- ~1388 called this “Post Production Support Analysis”

MIL-STD-1388-1A, Task 403
ACTIVITY 15 – FIELD FEEDBACK

15.1 • Feedback Sources

15.2 • Feedback Analysis

- Verify achievement of the established objectives / thresholds

MIL-STD-1388-1A, Task 501
ACTIVITY 16 – DISPOSAL ANALYSIS

- Develop a Disposal Strategy

16.1 • Component Disposal

16.2 • Product Disposal (Repurpose)

Part of MIL-STD-1388-1A, Tasks 301/401
ACTIVITY 17 – OPERATIONAL  
SUITABILITY TEST, EVALUATION,  
VERIFICATION,& VALIDATION

17.1 • Test Strategy

17.2 • Product Support Package (PSP)

17.3 • Test Objectives/Resources

17.4 • Conduct Test

17.5 • Analyze Test Results

▪ Develop a system support package
▪ Develop a STEV&V strategy

MIL-STD-1388-1A, Task 501
Integration of data reduces duplication of effort and improves consistency.
CONCEPT OF A RELATIONAL DATABASE

- Objective: capturing & documenting PSA results
- A single source for consistent, comprehensive Supportability analysis results
- Each element of data is entered one time and used for many applications
- Each record contains multiple fields of data
- Data entries are carefully structured to facilitate data interchange (80 column, code assignments, SGML, etc.)
- Effective data summaries and filtering on specific elements of data to develop insights
  - For example: Select all field level maintenance tasks or select all tasks that use a specific item of support equipment
USING THE LOGISTIC PRODUCT DATA (LPD) DATABASE

A database serves many customers.
LOGISTICS PRODUCT DATA (LPD) USES

- DESIGNING THE SUPPORT SYSTEM

- **Maintenance Planning**
  - Maintenance Plan (LSA-019, LSA-024)
  - Maintenance Allocation Chart (LSA-0xx)
  - Preventive Maintenance Checks & Services
  - Maintenance Procedures for IETMs (Task Analysis XML Schema)

- **Support and Test Equipment**
  - Support Equipment Recommendation Data
  - Calibration Maintenance Requirements Summary
  - TMDE Registration

- **Supply Support**
  - Provisioning Technical Documentation Lists (Long Lead, Post Conference, Common, Bulk Items, etc.) (Provisioning XML Schema & Style Sheet)
  - Design Change Notice Information
  - Cataloging/Screening/Parts Breakout
  - Indentured Parts List (for IETMs)
LOGISTICS PRODUCT DATA USES (CON’T)

- Manpower, Personnel & Training
  - Qualitative & Quantitative Personnel Requirements Information
  - Manpower Authorization Criteria
  - Task Inventory/Training Task List
  - New/Modified Skill/Training Requirements
  - Identification of Training Devices

- Packaging, Handling, Storage, and Transportation
  - Packaging and Preservation Data (Packaging XML Schema and Style Sheet)
  - Transportability Requirements

- Facilities
  - New/Modified Facilities Requirements
  - Maintenance Tasks Requiring New/Modified Facilities

- Reliability and Maintainability
  - Reliability Centered Maintenance Results
  - FMECA Results
LPD SOFTWARE TOOLS

- Available MIL-STD-1388-2B and GEIA-STD-0007 compliant software tools:
  - SLIC/SLIC Wave (www.isscorp.com)
  - Omega/PS (www.pennantplc.co.uk/services/lsar)
  - Eagle (www.raytheoneagle.com/products_eagle)
- Government Software
  - PowerLOG (www.logsa.army.mil/lec/powerlog)
- Microsoft Excel/Access
  - Create your own in-house data management tool
Thank you for your attention!

Questions?