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Title: Design Interface & Supportability Analysis

Defense Acquisition University

Certification Training | Knowledge Sharing | Continuous Learning | Mission Assistance

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Purpose

- To communicate key Design Interface and Supportability Planning concepts to the Acquisition workforce
- To provide “Lessons Observed” to the Acquisition workforce
- To promote process standardization among Design Interface and Supportability Planning practitioners

Design Interface

Design Interface is the integrating function between system design and support-system design to facilitate identification of an optimized support system that will achieve cost and readiness thresholds, meet logistics footprint requirements, or otherwise reduce the logistics burden.

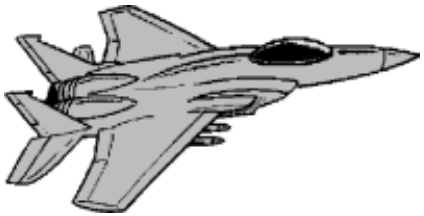
$$A_o = \{ R \ \& \ M \ \& \ S \}$$

Systems Engineering Environment

Design Interface

- -Maintenance Planning
- -Supply Support
- -PHS&T
- -Technical Data
- -Support Equipment
- -Training
- -Manpower & Personnel
- -Facilities
- -Computer Resources
- -Sustaining Eng.

$$Ao = \frac{MTBF}{MTBF + MTTR + MLDT}$$



MTBF: Mean Time Between Failure
MTTR: Mean Time to Repair
MLDT: Mean Logistics Delay Time

R: Reliability

Ao: Operational Availability

M: Maintainability
S: Supportability

Design Interface Goals

The goal of Design Interface is to eliminate, reduce, or simplify the need for logistics support . DI is a set of activities to control and manage design choices that impact Supportability. Design Interface is a "leading activity" that seeks to impact all Integrated Product Support (IPS) elements by the following:

- *Minimizing logistics footprint requirements*
- *Maximizing reliability*
- *Ensuring that maintainability is "user friendly" and effective*
- *Addressing long term issues related to obsolescence management*
- *Influencing technology refreshment*
- *Planning for modifications and upgrades*
- *Considering overall usage under all operating conditions*

Supportability Design Goals

Design Characteristics:

- *Testability*
- *Reliability*
- *Accessibility*
- *Maintainability*
- *Standardization*
- *Human Factors*
- *Obsolescence "tolerance"*

"Design the system for support!"

Design Interface

The basic “items” that need to be considered as part of Design Interface activity include:

- *User CONOPS*
- *Reliability*
- *Maintainability*
- *Supportability*
- *IPS Elements*
- *Affordability*
- *Configuration Management*
- *Safety Requirements*
- *Environmental and HAZMAT Requirements*
- *Human Systems Integration*
- *Calibration*
- *Anti-Tamper*
- *Habitability*
- *Disposal*
- *Legal Requirements*

- DAU IPS Elements Guidebook (pg 147)

Influencing Design

Early in the process, analyses are conducted to influence design and to determine an initial maintenance concept. Design Interface activities support Systems Engineering and Maintenance Planning activities. Analyses to be considered are:

- *Use Study (4)*
- *Standardization and Interoperability (5)*
- *Functional Requirements Analysis (9)*
- Baseline Comparison System (6.2)
- Comparative Analysis (6)
- Analysis of Alternatives (AoA)
- Early Distribution Analysis (13)
- Environment, Safety and Occupational Health (ESOH) hazards Analysis

The following are opportunities to influence system design:

- *System modifications*
- *Technology Roadmap planning*
- *Spiral capability upgrades*
- *DMSMS mitigation activities*

RESOURCES

PEOPLE

- PMO
- SusEng
- FSRs
- CSS

FUNDING

- APN/WPN/ OPN
- O & M
- RDT & E
- WCF
- MILCON

PRODUCTS

CONTRACT

SOW/SOO

- Process Constraints
- Product Deliveries (IPS Elements)
- Tech/Support Services

TECHNICAL

SPECIFICATION

(attached to a contract)

"Design Constraints"

- Weapon System
- Product Support System
- IPS Elements
- Depot Spec. (or Work Standards)

Maintenance concept and resource allocation recommendations expressed through IPS Elements

"The Plan"

Manpower and Funding

Manpower and Funding

User CONOPS

A/C Design

PLAN Maintenance

-Product Support Analysis (PSA)

- -FMECA
- -RCM
- -MTA
- -LORA

PERFORM Maintenance

- O-Level
- I-Level
- D-Level

System Ao

Issue Indications

BOM Issues
ISRs
Material Condition
TPDRs
Lack of Procedures
REIs and LESs
Lack of SE
Training Shortfalls
SM&R Errors
DCNs

"The Actuals"

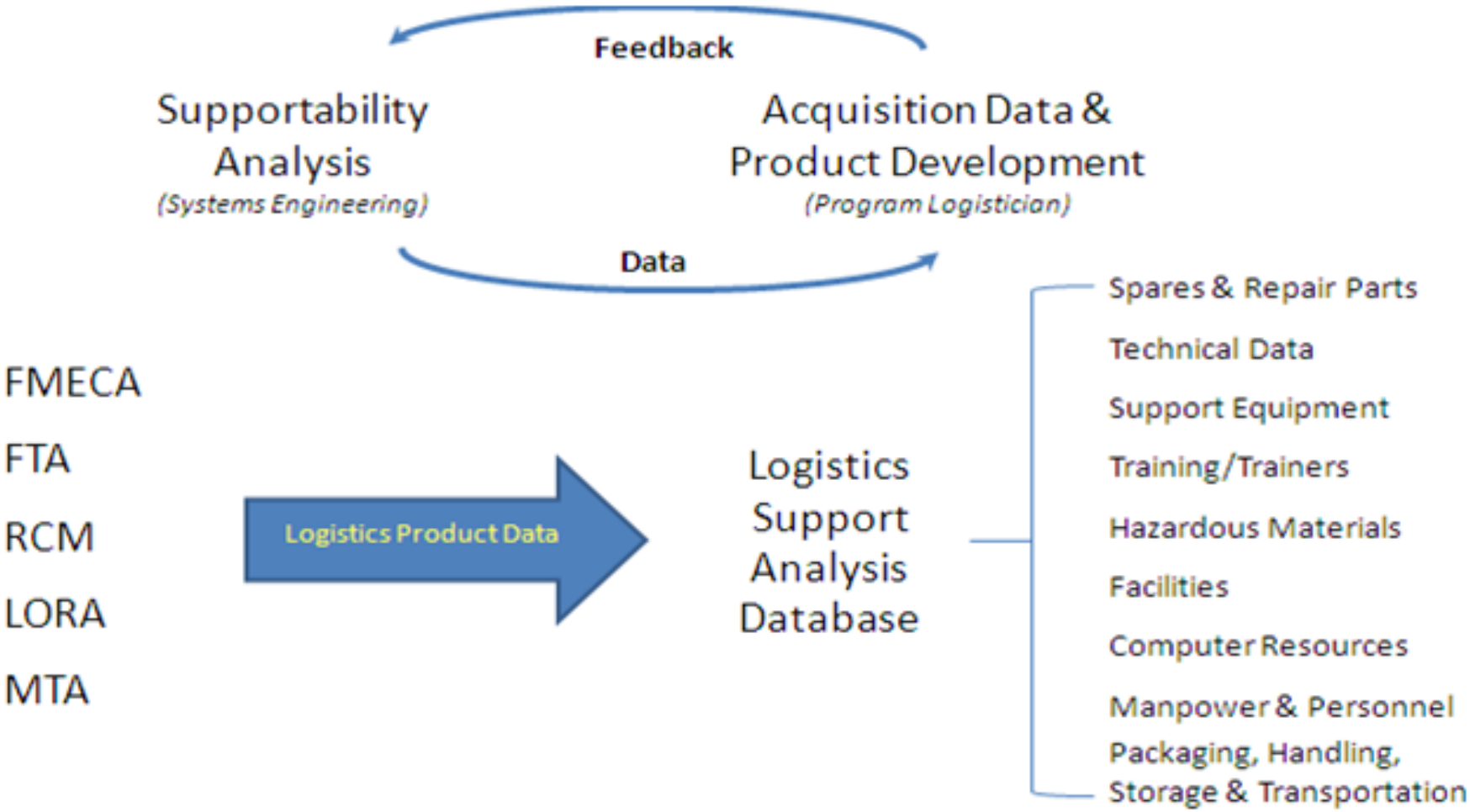
User outcomes related to system Readiness, cost, material condition, and maintenance expenditures

Key Take-Away: *If the Feedback Loop is broken the system cannot optimize!*

Active Analysis and Feedback

- The acquisition process uses all available information as a starting point for initial Maintenance (Supportability) Planning
- Over time active analysis and feedback is required to “Reset” Maintenance Plans to drive optimized outcomes (i.e., lower O&S cost and higher system Availability)
- Poor planning, implementation, and/or poor feedback sub-optimize User maintenance outcomes

Supportability Planning



FMECA – Failure Mode and Effects Analysis
FTA – Fault Tree Analysis
RCM – Reliability-Centered Maintenance
LORA – Level of Repair Analysis
MTA – Maintenance Task Analysis

What is PSA?

- Product Support Analysis (PSA):
  - Proven analytical process where a series of activities (TA-STD-0017) are accomplished within each phase of systems acquisition (MIL-HDBK-502A)
  - When accomplished, Logistics Product Data (LPD) are identified (GEIA-STD-0007) and entered into the PSA database
  - PSA database enables development of LPD summaries (TA-HB-0007-1) that support acquisition
    - Task Summary identifies the operations and maintenance (O&M) tasks used for technical manual and training course development
    - Provisioning Summary identifies all of the initial spares and repair parts required to support the approved maintenance concept

Benefits of PSA

- PSA is a repeatable process
  - Follows a set of standards agreed upon by government and industry
- LPD are developed by accomplishing PSA activities
  - LPD feed development of IPS Elements
    - PSA feeds development of IETMs, Supply Support Posture, SE requirements, Training Development, and all other IPS Elements
    - Ensures linkage between IPS Elements
- Database becomes single source for development of all support resources
  - Consistency is maintained, traceability is provided
  - Lessons Learned: Various programs
- Alignment between the Operation & Maintenance tasks and support resources
- Overall cost savings
  - Maintain database to feed IPS elements/updates-feedback loop/ECPs etc.

PSA Activities

- ACTIVITY 1 – PRODUCT SUPPORT STRATEGY, *Establish the initial maintenance concept*
- ACTIVITY 2 – PRODUCT SUPPORT PLANNING, *Develop the Product Support Analysis Plan (PSAP)*
- ACTIVITY 3 – PROGRAM AND DESIGN REVIEWS, *Establish requirements for SETRs and PSA TIMs*
- ACTIVITY 4 – APPLICATION, *Develop the Use Study*
- ACTIVITY 5 – SUPPORT SYSTEM STANDARDIZATION, *Establish requirements for Hardware/ Software Standardization*
- ACTIVITY 6 – COMPARATIVE ANALYSIS, *Develop the BCS and conduct Comparative Analysis*
- ACTIVITY 7 – TECHNOLOGICAL OPPORTUNITIES, *Identify Potential New Technology*
- ACTIVITY 8 – SUPPORTABILITY AND SUPPORTABILITY RELATED DESIGN FACTORS, *Identify impact on operations and support capabilities, risks and data rights issues*
- ACTIVITY 9 – FUNCTIONAL REQUIREMENTS, *Reliability Centered Maintenance Analysis, PSA Candidate List and Task Inventory*
- ACTIVITY 10 – SUPPORT SYSTEM ALTERNATIVES, *Alternatives and Plans*
- ACTIVITY 11 – EVALUATION OF ALTERNATIVES AND TRADEOFF ANALYSIS, *Level of Repair Analysis*
- ACTIVITY 12 – TASK ANALYSIS, *Maintenance Task Analysis results*
- ACTIVITY 13 – EARLY DISTRIBUTION ANALYSIS, *Readiness Impacts*
- ACTIVITY 14 – DIMINISHING MANUFACTURING SOURCES AND MATERIAL SHORTAGES MANAGEMENT (DMSMS)/OBSOLESCENCE SYSTEM SUPPORT ANALYSIS, *DMSMS Plan*
- ACTIVITY 15 – FIELD FEEDBACK, *User's Opinions from the Fleet*
- ACTIVITY 16 – DISPOSAL ANALYSIS, *Disposal Plan*
- ACTIVITY 17 - OPERATIONAL SUITABILITY TEST, EVALUATION, VERIFICATION AND VALIDATION, *Test Strategy*

GUIDANCE APPLICATION

Where do I start?

1. Identify the PSA activities* to be accomplished (TA-STD-0017 / MIL-HDBK-502A)
2. Identify when the activities are to be accomplished
3. Specify PSA database software compliance (GEIA-STD-0007)
4. Specify the approach for Government use or receipt of the LPD
5. Identify the required PSA summaries and data attributes, i.e., LPD

* *PSA activities must be tailored for each acquisition*

Last Words

Help is available….You are not out there alone!

- *“The way of fools seems right to them, but the wise listen to advice.”* **Proverbs 12:15**

Questions?

References

- SAE-TA-STD-0017
- MIL-HDBK-502A
- GEIA-STD-0007
- SAE-TA-HB-0007-1

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