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Product Support Analysis: The Intersection of Supportability Analysis and Acquisition Logistics

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Defense Acquisition University

Certification Training | Knowledge Sharing | Continuous Learning | Mission Assistance

Date: 13 May 2015
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PRODUCT SUPPORT ANALYSIS (PSA)

PRODUCT SUPPORT ANALYSIS (PSA)

Supportability Analysis **Acquisition Logistics**

PRODUCT SUPPORT ANALYSIS (PSA)

Supportability Analysis

(Systems Engineer)

Acquisition Logistics

(Program Logistician)

PRODUCT SUPPORT ANALYSIS (PSA)

Supportability Analysis
(Systems Engineer)

FMECA

FTA

RCMA

MTA

LORA

Acquisition Logistics
(Program Logistician)

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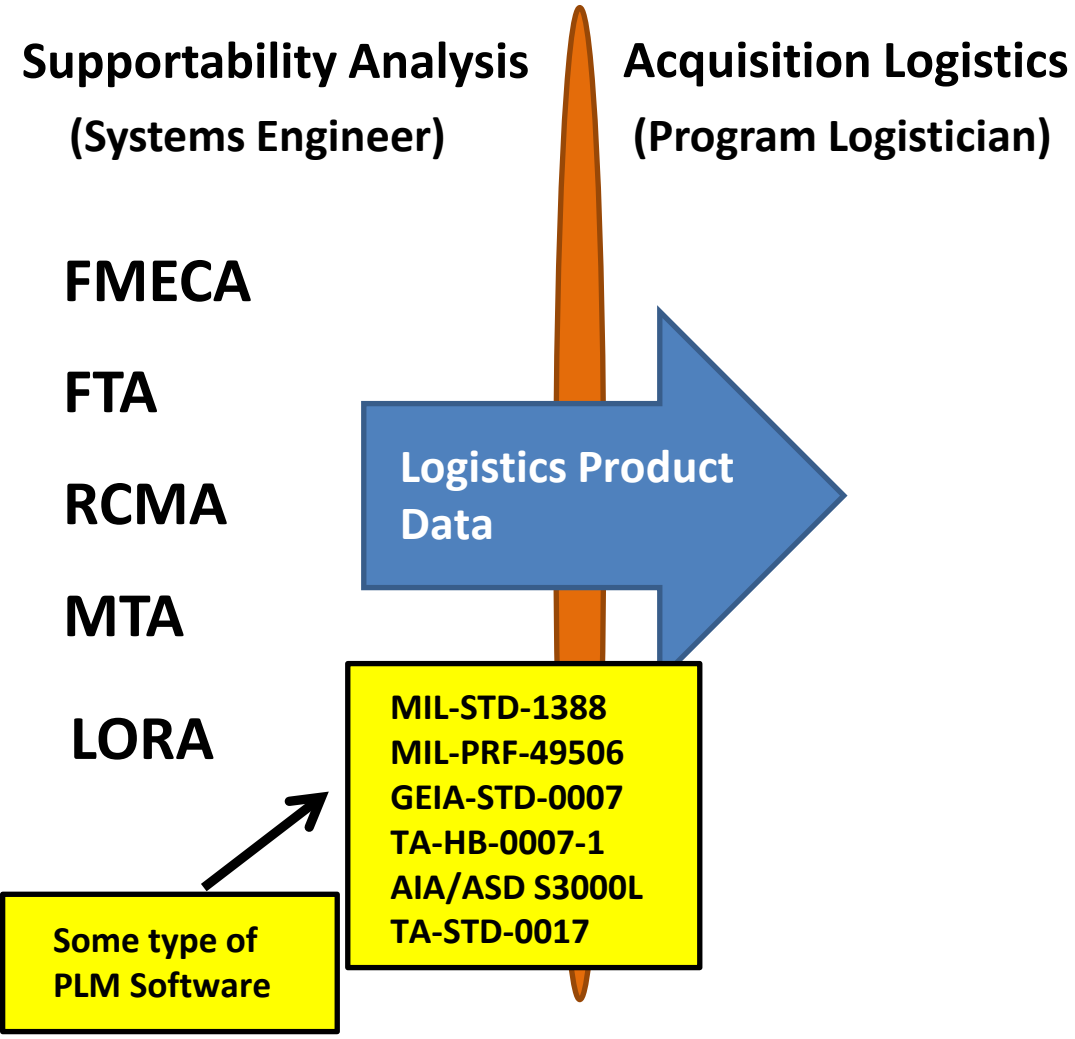
PRODUCT SUPPORT ANALYSIS (PSA)



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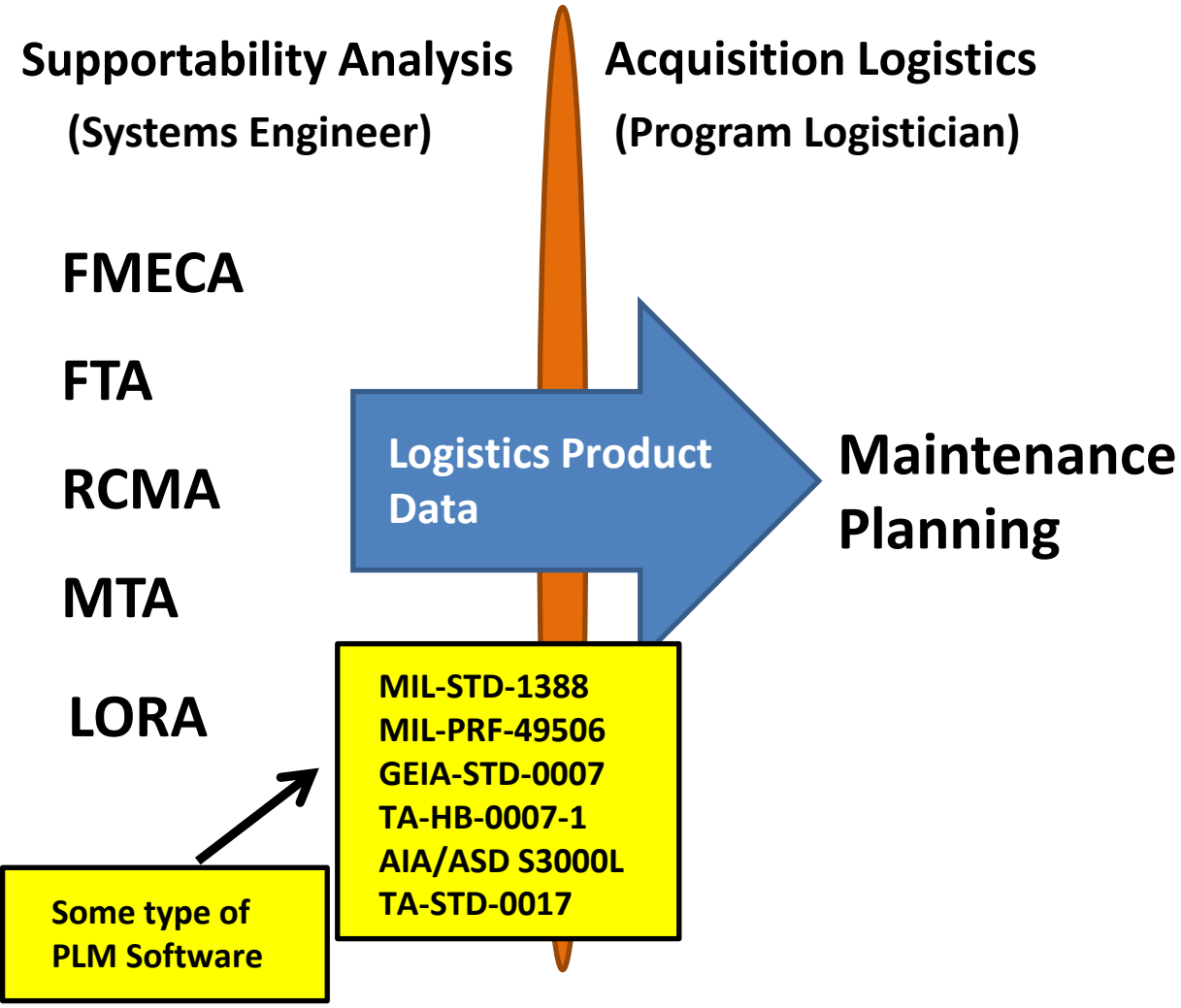

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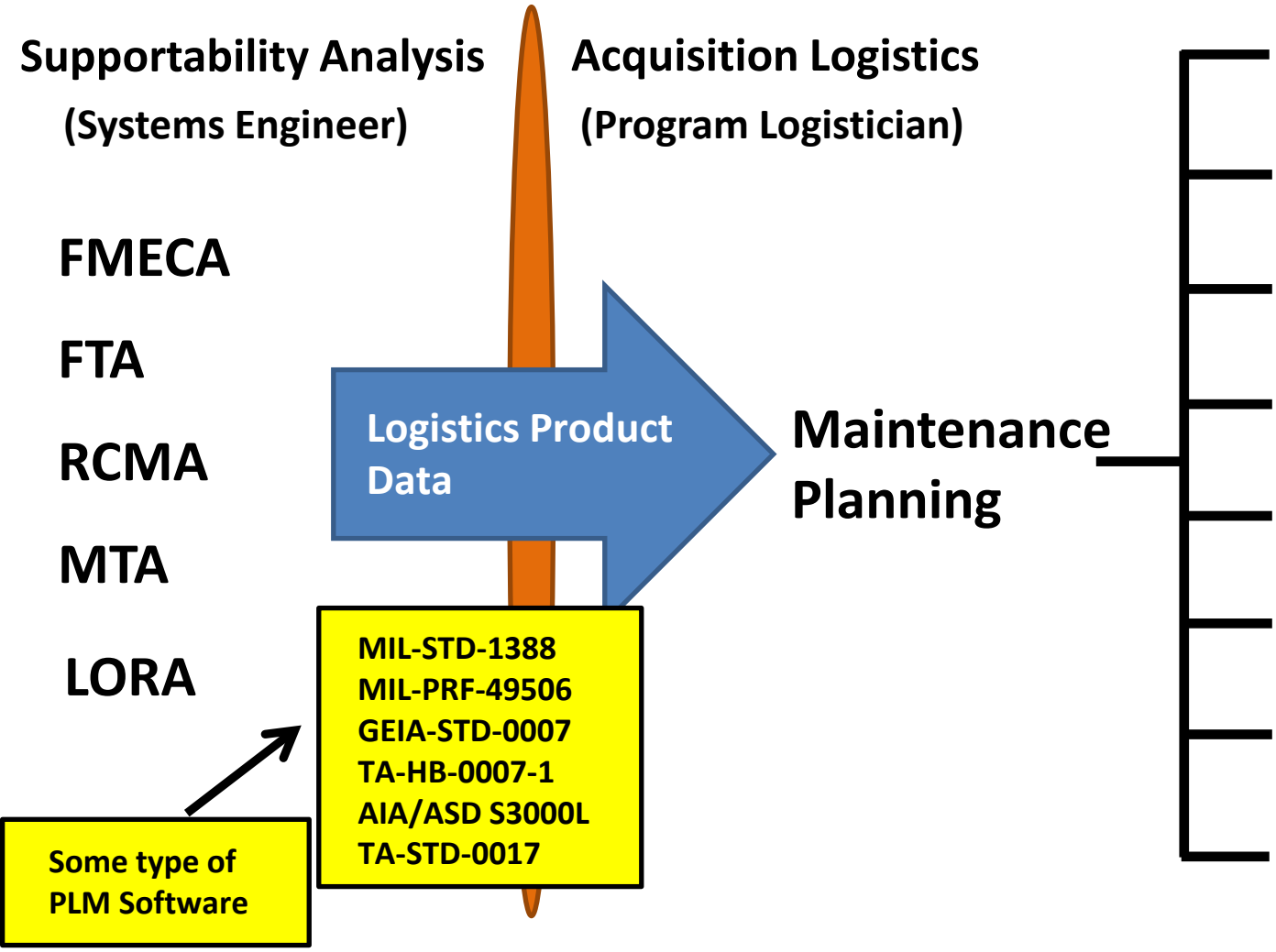

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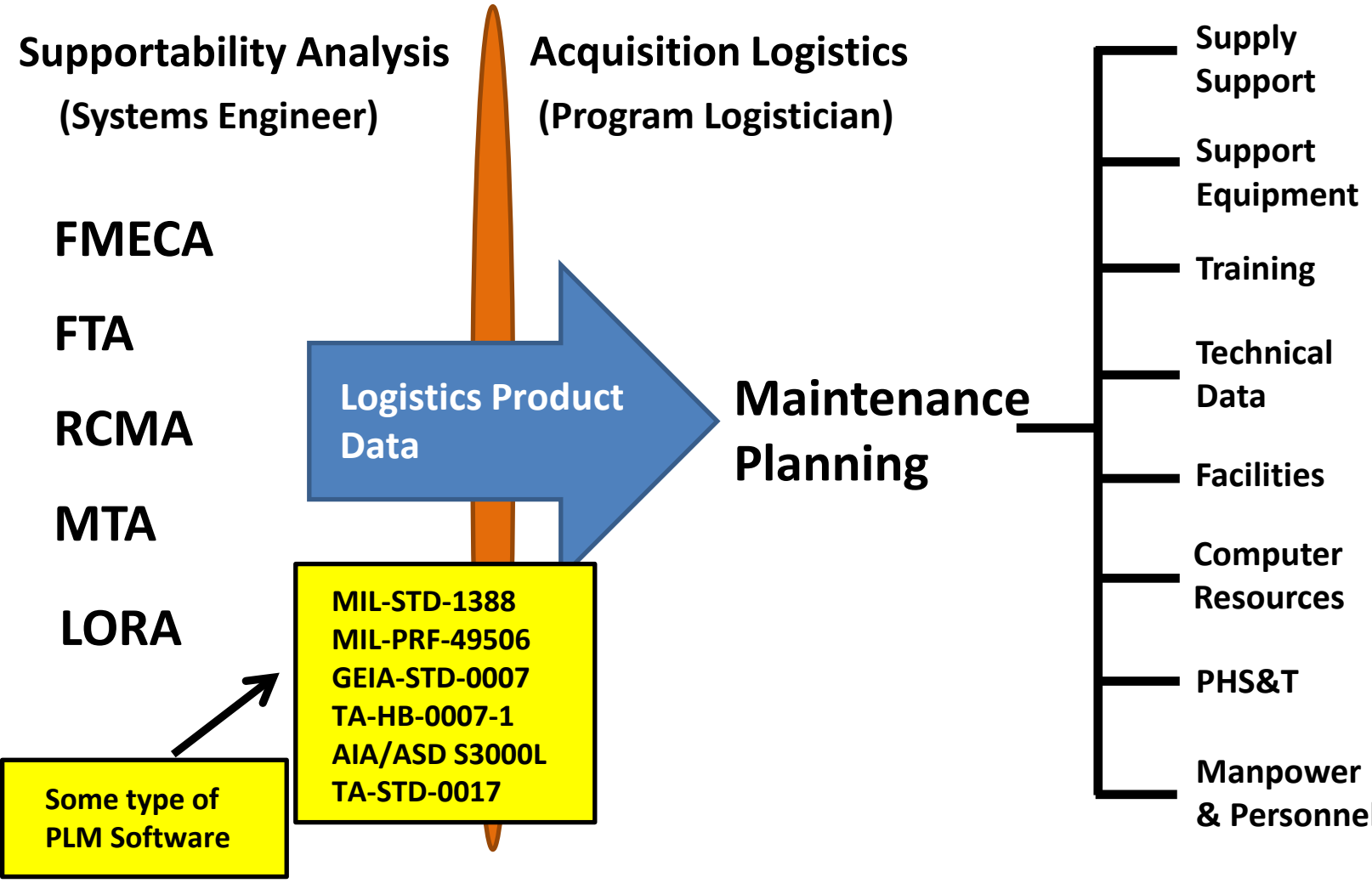

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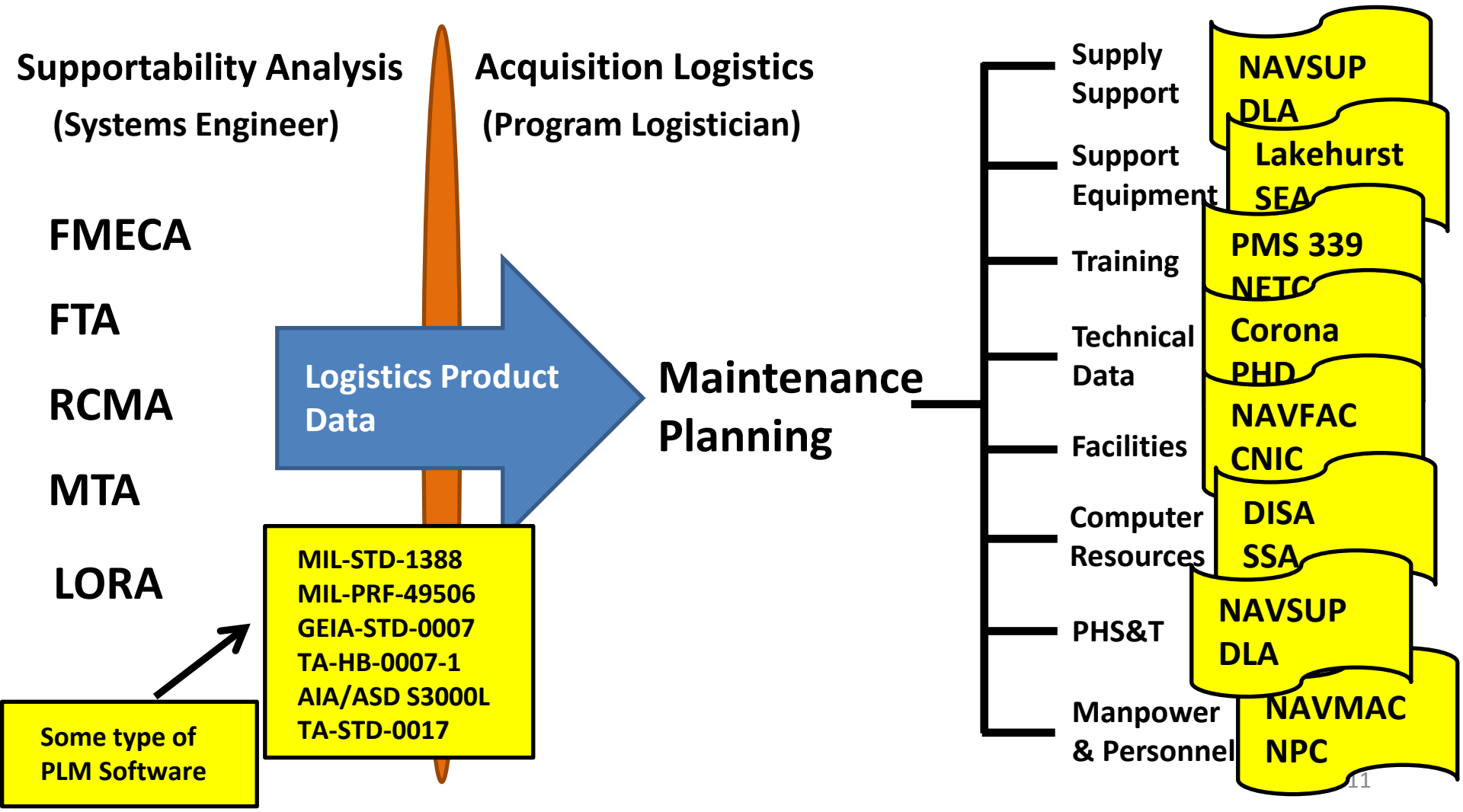

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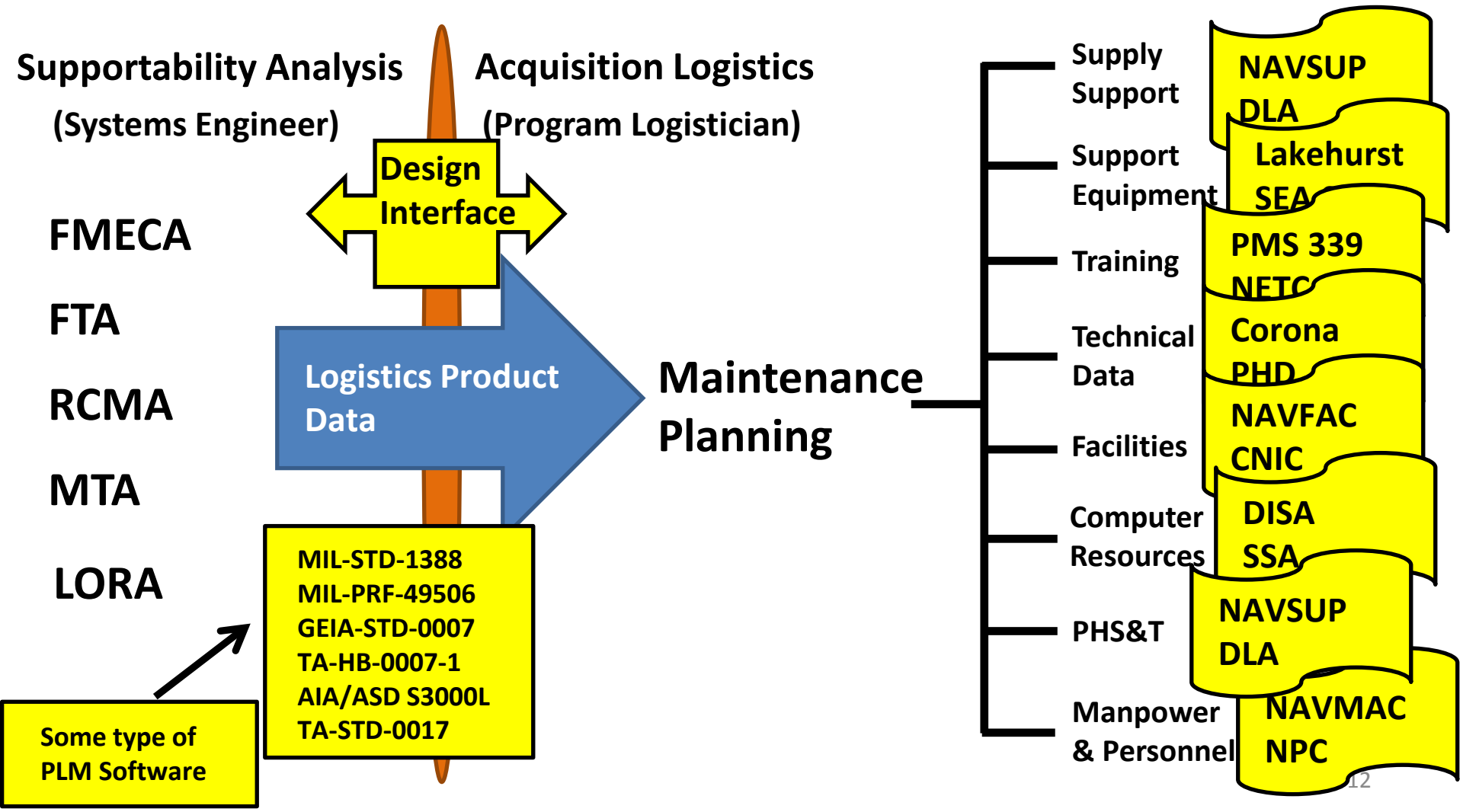

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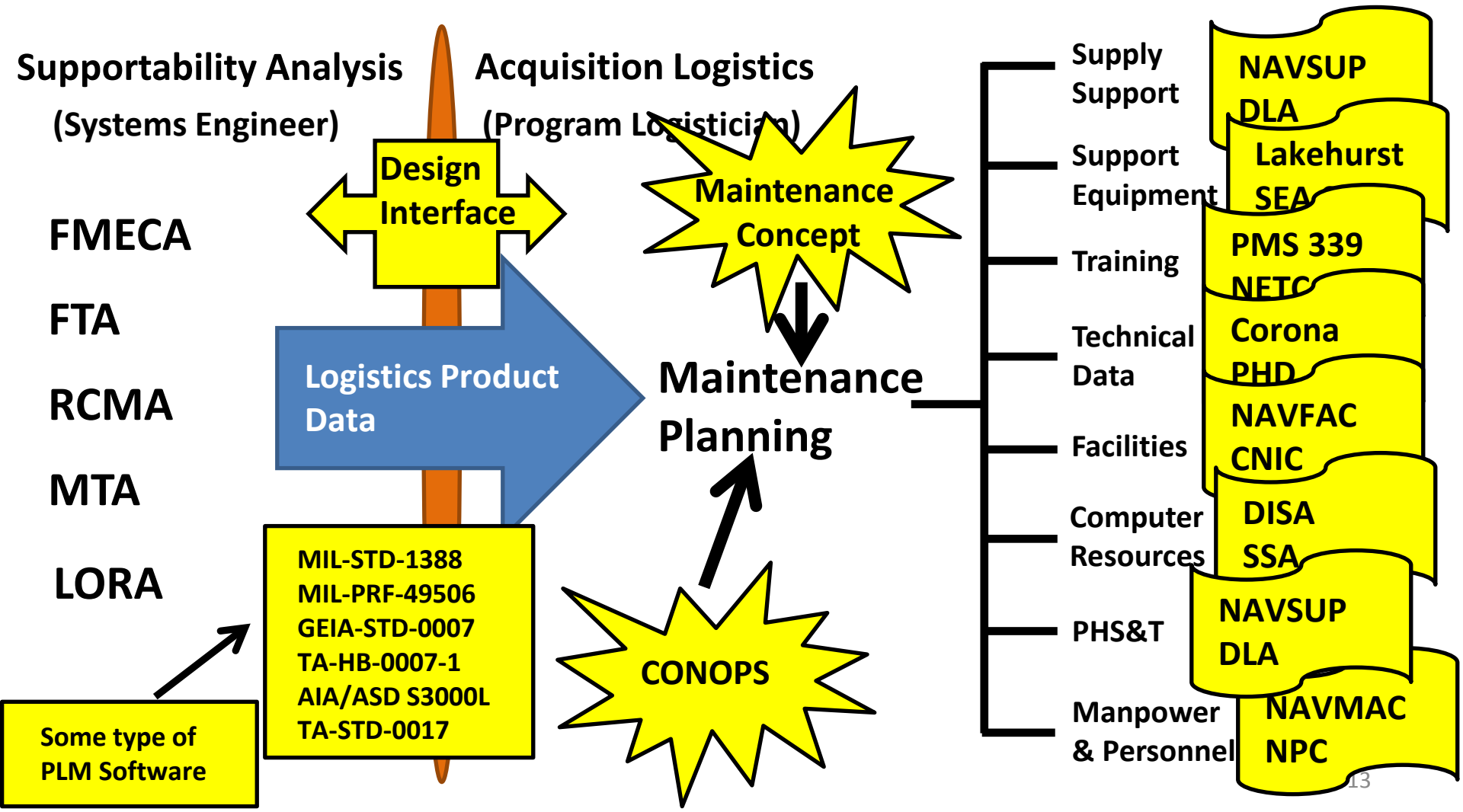
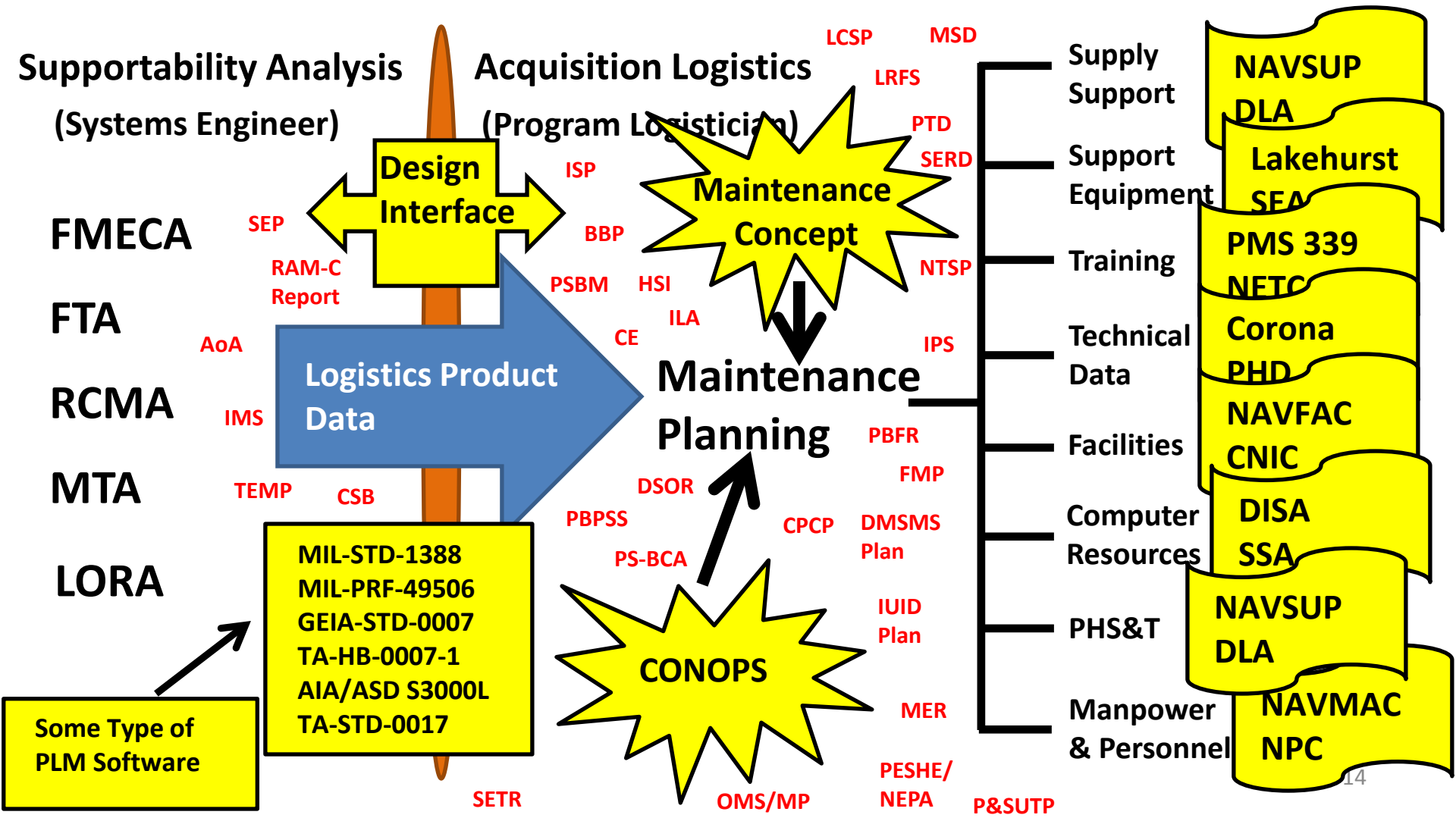


PSA IMPACTS


Supportability Analysis
(Systems Engineer)
Acquisition Logistics
(Program Logistician)
FMECA
FTA
RCMA
MTA
LORA
SEP
RAM-C Report
AoA
IMS
TEMP
SETR
CSB
Design Interface
ISP
BBP
PSBM
HSI
ILA
CE
Logistics Product Data
MIL-STD-1388
MIL-PRF-49506
GEIA-STD-0007
TA-HB-0007-1
AIA/ASD S3000L
TA-STD-0017
Some Type of PLM Software
LCSP
MSD
LRFS
PTD
SERD
Maintenance Concept
NTSP
IPS
Maintenance Planning
PBFR
FMP
DSOR
PBPSS
CPCP
DMSMS Plan
PS-BCA
IUID Plan
CONOPS
MER
PESHE/ NEPA
OMS/MP
P&SUTP
Supply Support
Support Equipment
Training
Technical Data
Facilities
Computer Resources
PHS&T
Manpower & Personnel
NAVSUP
DLA
Lakehurst
SEA
PMS 339
NETC
Corona
PHD
NAVFAC
CNIC
DISA
SSA
NAVSUP
DLA
NAVMAC
NPC

ACRONYMS

- AoA - Analysis of Alternatives
- BBP – Better Buying Power
- CE – Cost Estimating
- CPCP – Corrosion Prevention Control Plan
- CSB – Configuration Steering Board
- DMSMS – Diminishing Manufacturing Sources and Material Shortages
- DSOR – Depot Source of Repair
- HSI – Human Systems Integration
- ILA – Independent Logistics Assessment
- IMS – Integrated Master Schedule
- IPS – Intellectual Property Strategy
- ISP – Interim Support Plan
- IUID – Item Unique Identification
- FMP - Facilities Management Plan
- LCSP – Life Cycle Sustainment Plan
- LRFS – Logistics Requirements Funding Summary
- MER – Manpower Estimate Report
- MSD – Material Support Date
- NEPA – National Environmental Policy Act
- NTSP – Navy Training Systems Plan
- OMS/MP – Operational Mode Summary / Mission Profile
- P&SUTP – Preservation & Storage Unique Tooling Plan
- PBFR – Platform Basic Facility Requirements
- PBPSS – Performance Based Product Support Strategy
- PESHE – Programmatic Environment, Safety and Occupational Health Evaluation
- PS-BCA – Product Support Business Case Analysis
- PSBM – Product Support Business Model
- PTD – Provisioning Technical Documentation
- RAM-C Report – DoD Reliability, Availability, Maintainability & Cost Rationale Report
- SEP – Systems Engineering Plan
- SERD – Support Equipment Recommendation Data
- SETR – Systems Engineering Technical Review
- TEMP – Test and Evaluation Master Plan

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DESIGN INTERFACE

- Simple definition for Design Interface: The integration of the quantitative design characteristics of systems engineering with the functional logistics support elements.
- Design Interface drivers:

1) Accessibility (Section 508)
2) Affordability-SE Trade-Off Analysis
3) Anti-Counterfeiting
4) COTS
5) Corrosion Prevention & Control
6) Critical Safety Item
7) Demilitarization & Disposal
8) DMSMS 
9) ESOH
10) Human Systems Integration
11) Insensitive Munitions
12) Intelligence (LMDP)
13) Interoperability & Dependency
14) IUID
15) Open Systems Architecture
16) Operational Architecture
17) PHS&T
18) PQM
19) Reliability & Maintainability Engineering
20) Spectrum Management
21) Standardization
22) Supportability
23) Survivability & Susceptibility
24) System Security Engineering

IMPLEMENTING DESIGN INTERFACE

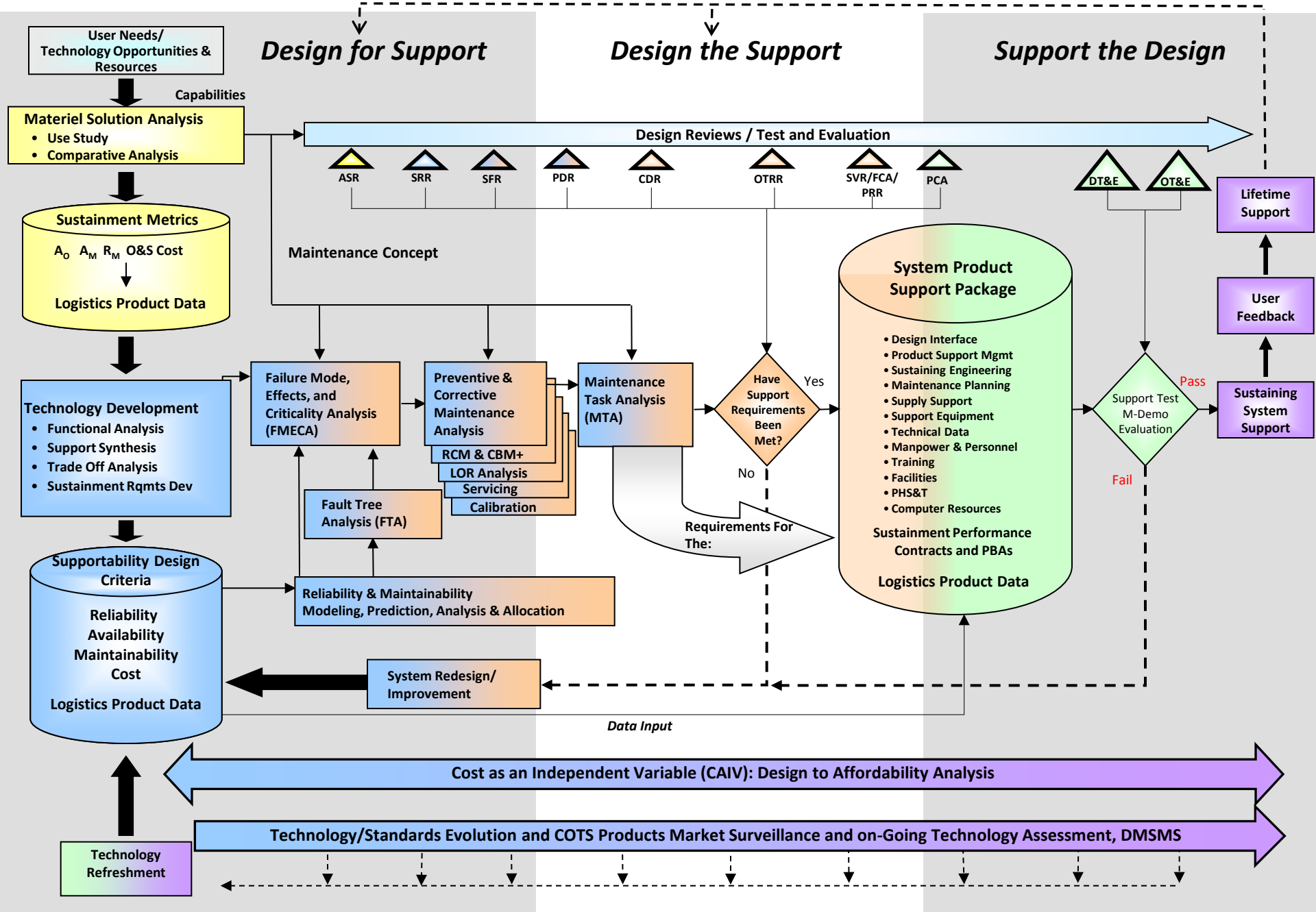
1. Understand the system design and product support requirements.

2. Employ/participate in an IPPD approach.

3. Ensure performance parameters and system attributes are translated into the system design specification.

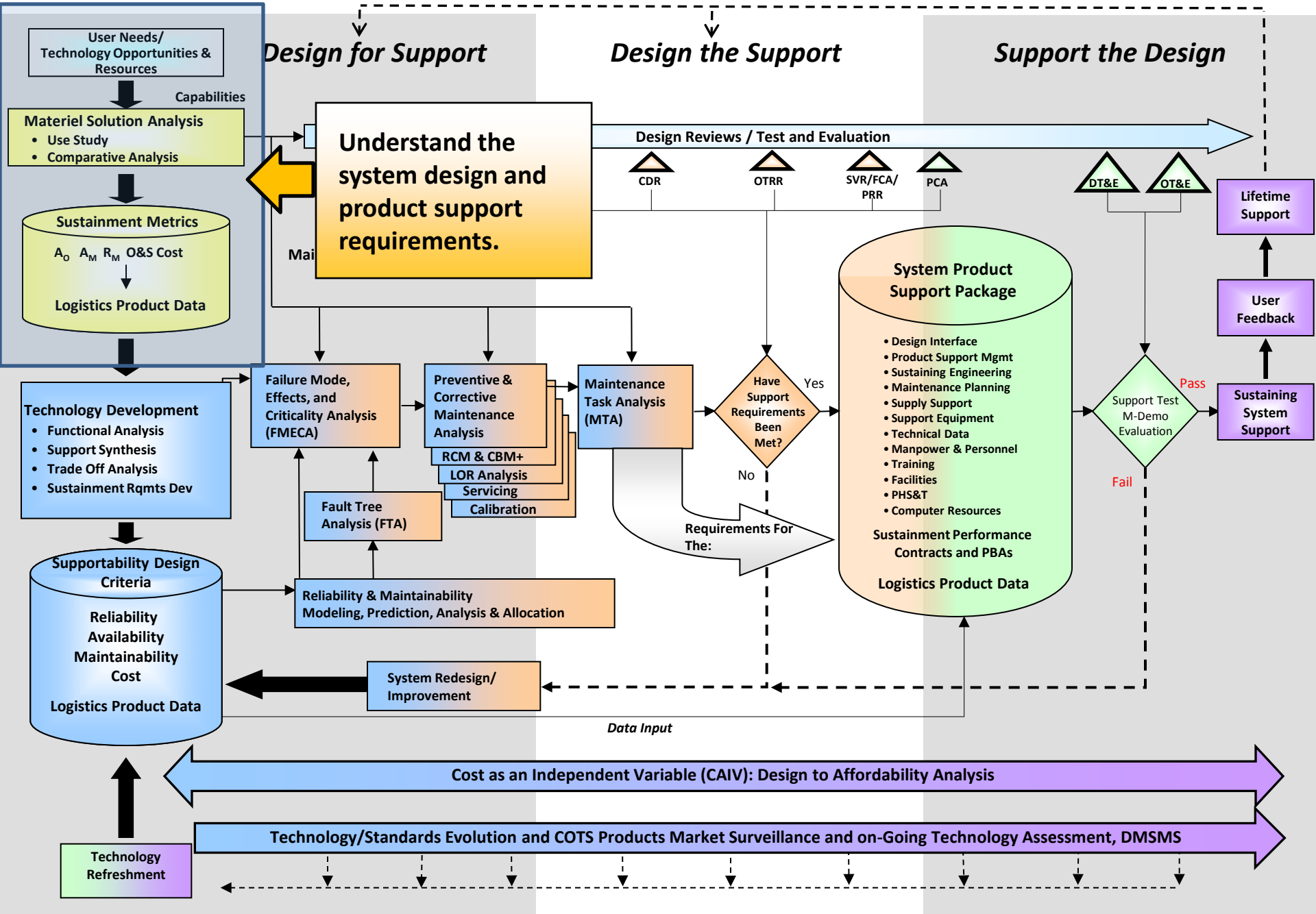
Supportability Analysis Life Cycle Framework

Continuous Assessment and Improvement for Affordability



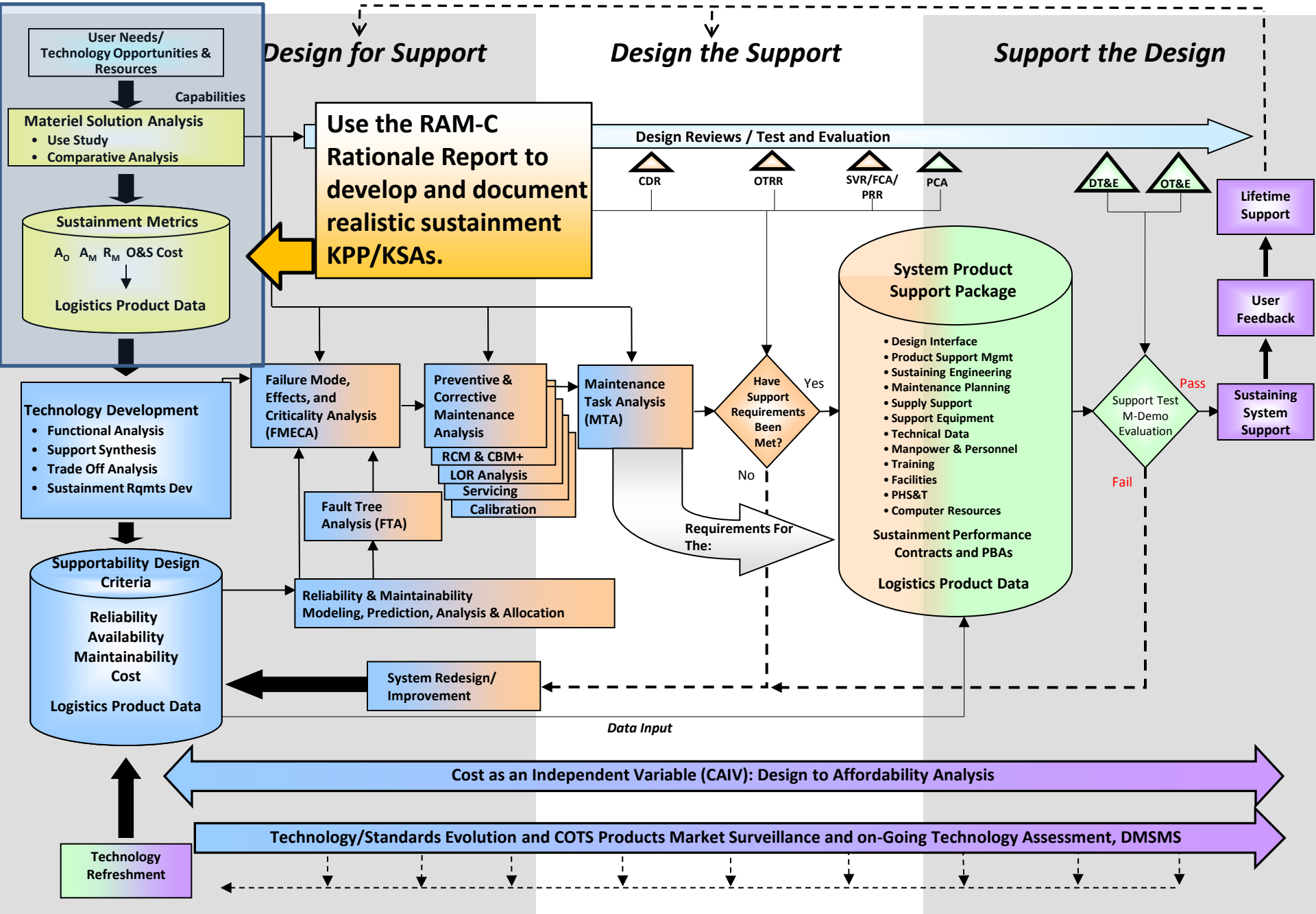
Supportability Analysis Life Cycle Framework

Continuous Assessment and Improvement for Affordability



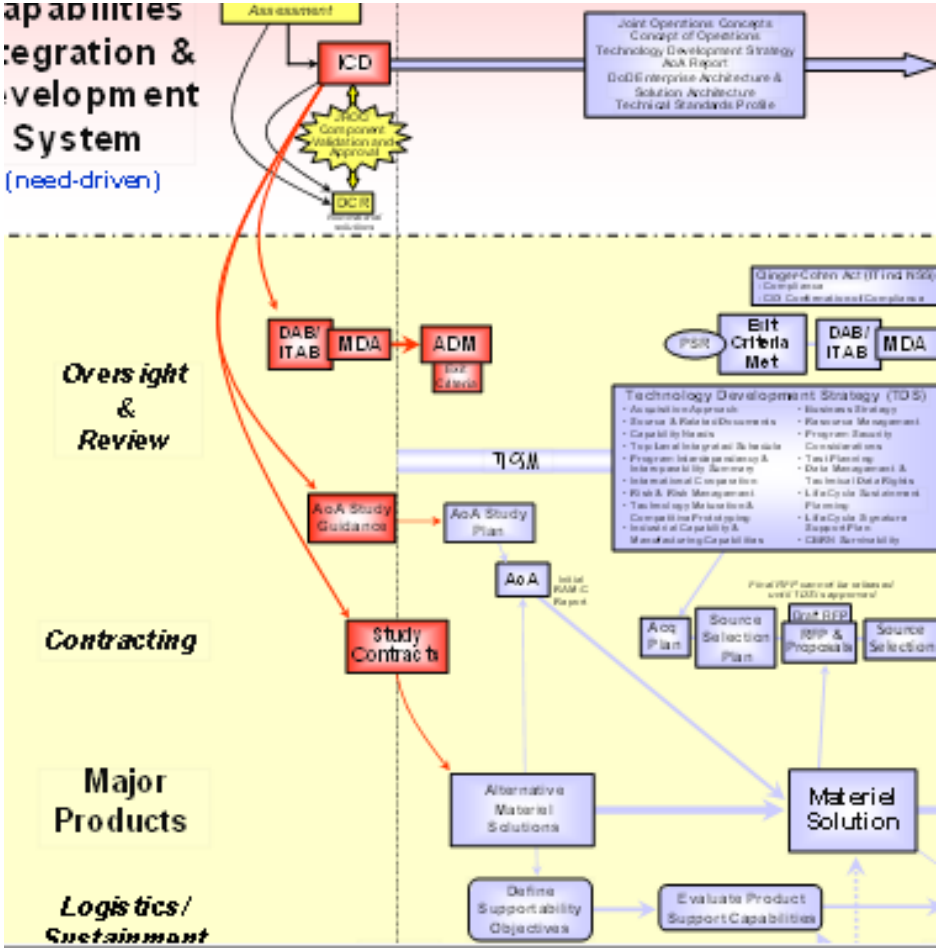
Supportability Analysis Life Cycle Framework

Continuous Assessment and Improvement for Affordability



RAM-C RATIONALE REPORT MANUAL (JUNE 1, 2009)

- The guide was written to help capability document requirements writers and their supporting engineering organizations think through the top-level sustainment requirements for RAM-C early in the requirements generation and refinement phases of a program to ensure the system is sustainable and affordable throughout its life cycle.



AVAILABILITY KPP

A_M = Material Availability

A_O = Operational Availability

MTBM = Mean Time Between Maintenance

MDT = Mean Down Time

E.I. = End Item

22

AVAILABILITY KPP

A_M

A_O

A_M = Material Availability	MTBM = Mean Time Between Maintenance	
A_O = Operational Availability	MDT = Mean Down Time	E.I. = End Item

23

AVAILABILITY KPP

$$A_M = \frac{\text{\# E.I. Operational}}{\text{Total population of E.I.}} = \frac{\text{MTBM}}{\text{MTBM + MDT}} = \frac{\text{Uptime}}{\text{Uptime + Downtime}} = A_O$$

A_M = Material Availability
MTBM = Mean Time Between Maintenance
A_O = Operational Availability
MDT = Mean Down Time
E.I. = End Item

24

AVAILABILITY KPP

$$A_M = \frac{\text{\# E.I. Operational}}{\text{Total population of E.I.}} = \frac{\text{MTBM}}{\text{MTBM + MDT}} = \frac{\text{Uptime}}{\text{Uptime + Downtime}} = A_O$$

15

A_M = Material Availability

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E.I. = End Item

25

AVAILABILITY KPP

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$$.75 = \frac{15}{\quad}$$

A_M = Material Availability	MTBM = Mean Time Between Maintenance	
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26

AVAILABILITY KPP

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$$.75 = \frac{15}{15 + 5}$$

A_M = Material Availability	MTBM = Mean Time Between Maintenance	
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28

AVAILABILITY KPP

$$A_M = \frac{\text{\# E.I. Operational}}{\text{Total population of E.I.}} = \frac{\text{MTBM}}{\text{MTBM + MDT}} = \frac{\text{Uptime}}{\text{Uptime + Downtime}} = A_O$$

$$.75 = \frac{15}{15 + 5}$$

- **Active Corrective Maintenance Time**
- **Active Preventive Maintenance Time**
- **Awaiting 1 or more elements of logistics support**

A_M = Material Availability	MTBM = Mean Time Between Maintenance	
A_O = Operational Availability	MDT = Mean Down Time	E.I. = End Item

29

AVAILABILITY KPP

$$A_M = \frac{\text{\# E.I. Operational}}{\text{Total population of E.I.}} = \frac{\text{MTBM}}{\text{MTBM + MDT}} = \frac{\text{Uptime}}{\text{Uptime + Downtime}} = A_O$$

Trade Space (RAM-C)

$$.75 = \frac{15}{15 + 5}$$

- **Active Corrective Maintenance Time**
- **Active Preventive Maintenance Time**
- **Awaiting 1 or more elements of logistics support**

A_M = Material Availability
MTBM = Mean Time Between Maintenance
A_O = Operational Availability
MDT = Mean Down Time
E.I. = End Item

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SAMPLE PSA RFP/SOW LANGUAGE

- **The SOW establishes the product/system development requirements; the CDRL orders delivery of the data according to the SOW, and the DIDs describe the format and content of the data/products ordered by CDRL.**
- The contractor shall design and develop the logistics support system concurrent with the system/equipment design. The objective will be reduction of the burden on the organic mechanic or technician. To achieve this objective, the contractor shall:
- Achieve the Navy's Am threshold of XX% and present a plan for achieving the Navy's objective Am of YY%. The contractor shall calculate and present the threshold value at Initial Design Review and discuss their plan to achieve the objective value. The contractor's ability to meet the threshold Am will be measured during Operational Test and Evaluation.
- The contractor shall design the system/equipment so that the maintenance tasks utilize existing manpower levels and skills.
- The contractor shall design the system/equipment so that the maintenance tasks utilize existing support equipment.
- The contractor shall design the system/equipment so that maintenance can be accomplished utilizing existing facilities.
- The contractor shall conduct a Failure Mode, Effects Analysis/Failure Mode, Effects and Criticality Analysis (FMEA/FMECA).
- The contractor shall perform a System Support Alternative Analysis (Activity 10) IAW TA-STD-0017 including the five sub-activities on the X System and be delivered IAW CDRL A056.
- The contractor's DI representative will improve ease of maintenance and repair of the system and increase Am through participation in design review activities and by working closely with design engineering to reduce MTBF, MTTR and MFHBOMF.
- The contractor's DI representative will minimize the total number of spares/parts and tools/test equipment required to accomplish system maintenance.
- The contractor's DI representative will work closely with design engineering to standardize parts and ensure interchangeability whenever possible.
- The contractor shall conduct supportability trade studies to ensure alternative designs do not increase the logistics burden on organic maintenance activities. The results of these supportability trade studies shall be documented and reported.

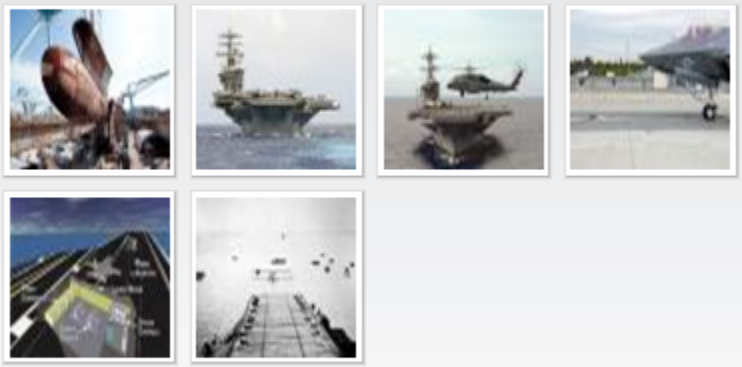
PSA RFP/SOW REFERENCES

1. *"Supportability Engineering Handbook"* (Jones), Appendix H: Contracting for Supportability Engineering
2. NAVAIR *"Contracting for Supportability Guide"* (1997)
3. USAF *"Contract Sustainment Support Guide"* (2011)
4. NAVAIR APML Essentials: https://home.navair.navy.mil/air66wiki/Default.aspx
5. DAU *"Integrated Product Support Element Guidebook"* (2011)
6. MIL-HDBK-502A *"Product Support Analysis"* (2013) Appendix A: Example CDRLs and DIDs

A 'Leap Ahead' for the 21st-Century Navy

Proceedings Magazine - September

2012 Vol. 138/9/1,315



By Rear Admiral William Moran and Rear Admiral Thomas Moore, U.S. Navy, and Captain Ed McNamee, U.S. Navy (Retired)

The new *Gerald R. Ford* -class aircraft carriers may have a hefty pricetag, but many believe the cost is worth it and that the ships will prove to be even more iconic than their predecessors.

The Navy and the contractor have learned a great deal during design and development of this new class of nuclear-powered carrier, and the lessons are being applied to reduce the costs of delivering the *Ford* , as well as the USS *John F. Kennedy* (CVN-79). This learning process has developed an affordable and sustainable path forward for the remainder of the class.

Amid the current cost debate, it's important to remember why the Navy chose to design and build a class of ship that will have a lifespan of 94 years and remain in service until 2110. The *Ford* class will deliver increased capability—at significantly reduced operating costs—and will remain at the forefront of a long-standing approach to countering threats and providing U.S. military presence in support of a wide variety of security objectives.

SUPPORTABILITY ANALYSIS POLICY

Navy

Supportability Analysis is the Systems Engineering application of logistics. Supportability Analysis is a logical, analytical, repeatable, auditable, step-by-step process that results in identification of the Product Support required to prevent or correct functional failures of the hardware system. Supportability Analysis results are provided as Product Support Data (GEIA-STD-0007) in the analytically developed Maintenance Plan constraining the design of the hardware system by the interface it has with the support environment in which it must operate.

Army

Supportability Analysis (SA) is conducted to determine the optimum set of logistic resource requirements for a system to achieve an objective system effectiveness at the minimum life cycle cost while minimizing the total Army logistics footprint. SA must be an integral part of the overall systems engineering effort. It is important to avoid the acquisition of redundant data. The integrated analyses can include any number of tools, practices, or techniques to realize the goals. Examples of specific types of analyses include tradeoff analysis, repair-level analysis, risk analysis, reliability predictions, reliability centered maintenance analysis, failure modes, effects and criticality analysis, life-cycle cost analysis, maintenance task analysis, facilities analysis, sensitivity analysis, and others.

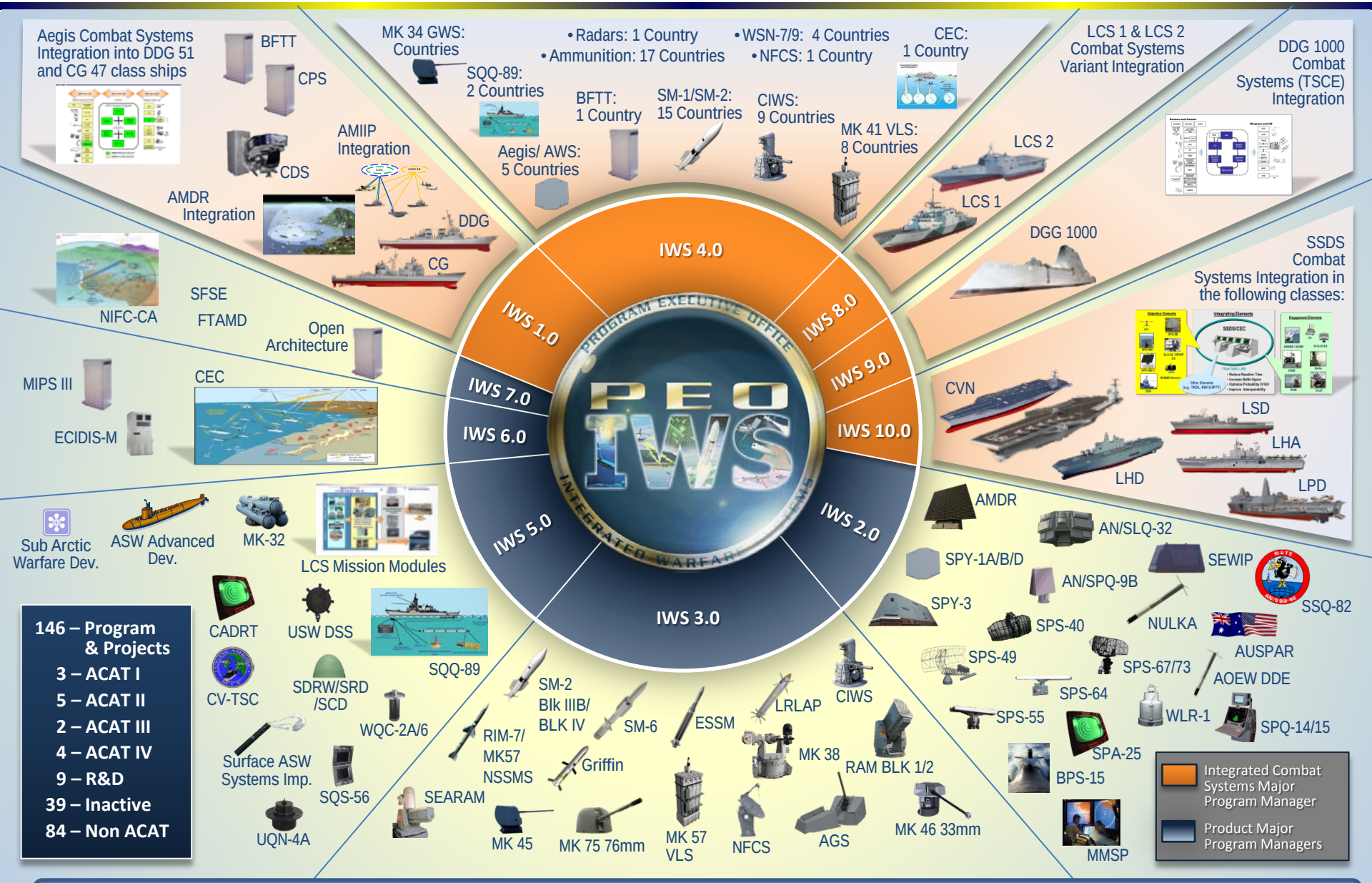
Air Force

Supportability Analysis is an analytical tool, conducted as part of the Systems Engineering process to determine the most cost-effective support of the system over its entire life cycle. It provides the basis for related design requirements to include Technical Orders, Support Equipment, Packaging, Handling, Storage & Transportation, Reliability, Maintainability & Availability, Producibility, Interoperability and Maintenance Concept that may be included in specifications.

OSD (MIL-HDBK-502A)

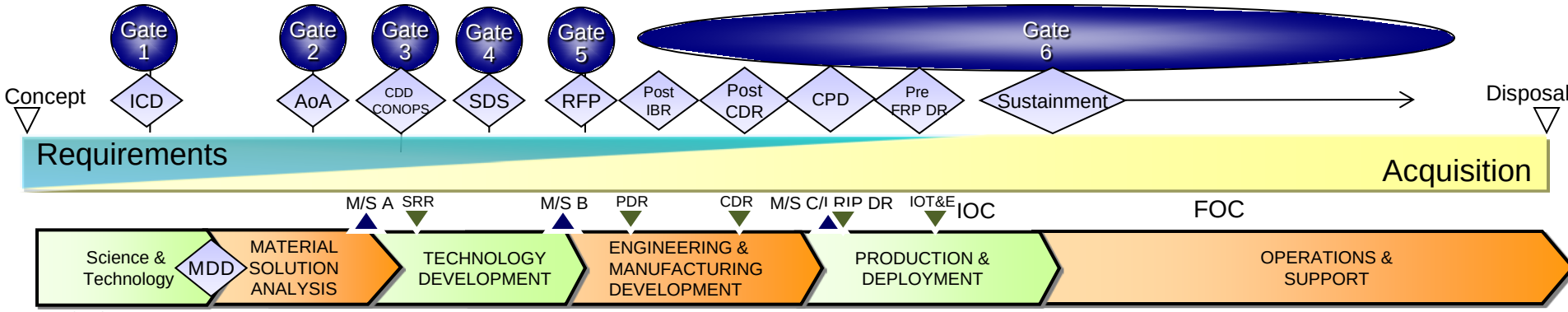
Product Support Analysis is a wide range of analyses that are conducted within the systems engineering process. The goals of PSA are to ensure that supportability is included as a system performance requirement and to ensure the system is concurrently developed or acquired with the optimal support system and infrastructure.

PEO IWS Portfolio



The PEO IWS acquisitions workload spans the full portfolio of programs and projects.

PEO IWS: Portfolio Composition



IWS 5.0
- Submarine Combat Systems Improvements
- Submarine Arctic Warfare Development

IWS 7.0
- Open Architecture
- SFSE

IWS 2.0
- AOEW New Start II
- SEWIP Lite New Start III **

IWS 2.0
- SEWIP BLK 3 New Start II

IWS 3.0
- ESSM Blk 2 - New Start II

IWS 6.0
- MIPS New Start III
- INS-R New Start

IWS 1.0
- AEGIS Weapon System (AWS) Development
- CDS
- CPS

IWS 2.0
- AMDR ID
- MMSP

IWS 3.0
- AGS/LRLAP

IWS 6.0
- ECDIS-N Software New Start III**

IWS 10.0
- SSDS Programs:
  - –SSDS MOD 2 (MOD 5C-FY10 B/L for LSD TR)

IWS 1.0
- BFTT (O&S) IV M (Includes BFTT Mod)

IWS 1F
- ADEPT

IWS 2.0
- AN/SPY-1D(V) II
- AN/SLQ-32(V)4 ESE IVT
- SEWIP Block 1B II
- SEWIP Block 2 II
- AN/SPQ-9B III
- NULKA III

IWS 2I
- CJR ID*

IWS 3.0
- SM-6 ID
- ESSM II
- RAM BLK 2 II
- CIWS MK 15 PHALANX BLK IB/SEARAM/LP WS II*
- 5"/62 MK 45 MOD 4 Gun III*
- MK 20 EOSS
- MK 160 GCS
- AMMO
- MK 46 30mm Gun
- MK 38 Gun Mod 2
- MK 110 57 mm Gun
- MK 41 VLS II*

IWS 5.0
- AN/SQQ-89 FoS
- CADRT IVT*
- USW DSS IVT

IWS 6.0
- CEC IC
- AN/WSN-9 DHYSL
- AN/BSN-2 DDD
- AN/WSN-7B AAP
- AN/WSN-8/8A DEML
- Scalable ECDIS-N

IWS 7.0
- NIFC-CA

IWS 1.0
- AWS Development
- AN/SPQ-15DDS
- Air Warfare Ship Self Defense (AW SSD) T&E
- Self Defense Test Ship (SDTS)

IWS 10.0
- SSDS FOS Programs
  - –SSDS MK1
  - –SSDS MK2 MOD 1A/1B (CVNs), MOD 2/2A(LPDs), MOD 3 (LHDs), MOD 4 (LHAs) IC *
  - –SSDS MK2 MOD 6C-ACB 12 for CVN 78
  - –NTDS
  - –ACDS II*
  - –RAIDS III*

IWS 2.0
- AN/SPY-1A/B/D*
- AN/SLQ-32(V)
- AN/SPQ-15 DDS
- AN/SPY-1A/B/D
- AN/SPS-40*
- AN/WLR-1(H)*
- AN/SPS-73(V)*
- AN/SPA-25G/H*
- AN/SPS-48 III*
- AN/SPQ-14 ASDS*
- AN/SYS-2(V) III*
- AN/SSQ-82(V)*
- AN/SPS-64*
- IN-SERVICE DECOYS* (Chaff, Rubber Duck, etc)
- AN/SPS-49 III*
- AN/SPQ-12 RADDS
- AN/SPS-67*
- AN/SPS-55*

IWS 3.0
- SM-2 BLK IIIB IC*
- NFCS III*
- SM- 2 BLK IV IC*
- Multi-Function Fuse MK 419 IVT*
- 5"54 MK 45 (MOD 1/2)
- MK75 76mm Gun
- RAM BLK 1 II*
- RIM-7
- MK 57 NSSMS

IWS 5.0
- CV-TSC III*
- AN/SQQ-89 FoS
- SVTT IVT*

IWS 6.0
- AN/WSN-7/7A RLGN IVT*
- AN/WQN-2 DSVL IVT*
- AN/WSN-2 IVT*
- SACC-A
- CNI

FMS Programs

IWS 4.0
- AEGIS/ AWS: 5 Countries
- SM-1/SM-2: 15 Countries
- CIWS: 9 Countries
- MK 41 VLS: 5 Countries
- MK 34 GWS: 3 Countries
- Radars: 1 Countries
- CEC:1 Country
- Ammunition: 17 Countries
- WSN-7/9: 4 Countries
- NFCS: 1 Country
- BFTT: 1 Country
- SQQ-89: 2 Countries

RDC Programs

IWS 3.0
- PC Griffin
- Stalker/APDIS

124 – Programs
- 3 – ACAT I
- 5 – ACAT II
- 2 – ACAT III
- 3 – ACAT IV
- 4 – R&D
- 30 – Inactive
- 77 – Non ACAT

* Inactive ACAT Programs are 90% delivered / expended
** Program initiates at M/S C