

Specialty Engineering Overview

NDIA Systems Engineering Division Meeting July 25, 2024

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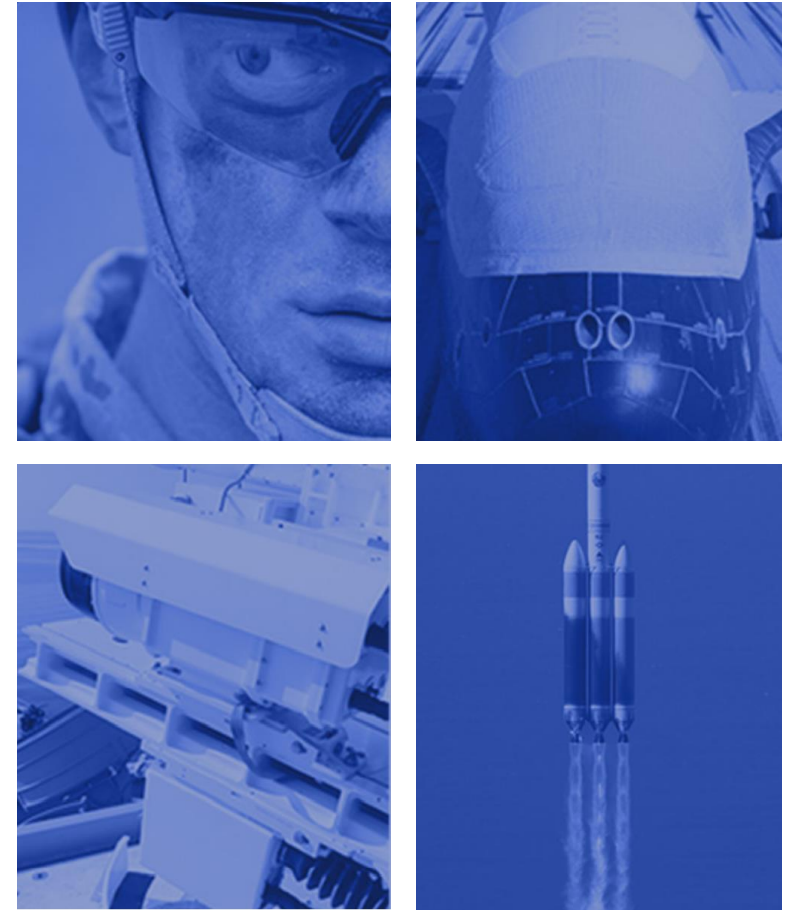




Specialty Engineering (SpE) in SE

“Specialty engineering is a component of Systems Engineering (SE) that complements the technical activities required to deliver a project. It typically deals with engineering that affects the performance, safety, usability, cost certainty, constructability, deliverability and lifecycle of the product outside of the normal functional aspects of engineering. ”

- INCOSE





Specialty Engineering (SpE) in SE

The Systems Engineering and Architecture (SE&A) Specialty Engineering (SpE) Directorate supports the Department of Defense (DoD) mission by ensuring current and future forces are operationally ready. This support focuses on improving delivery of advanced capability to warfighters by considering and applying reliability and maintainability (R&M), manufacturing and quality (M&Q), system safety (SS), human systems integration (HSI), and value engineering (VE) practices throughout the life cycle of DoD systems.

ORGANIZATION FOCUS AREAS

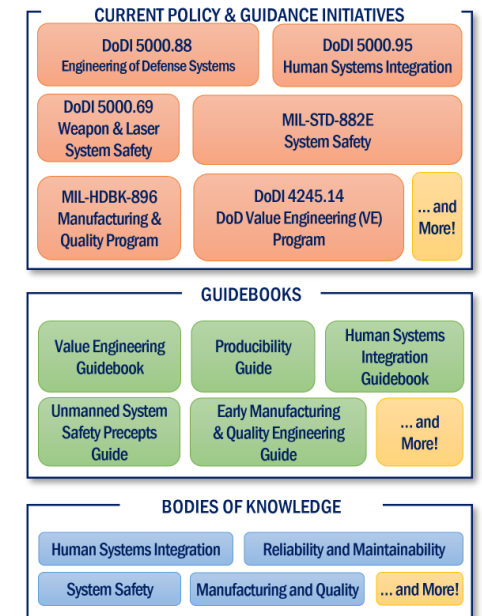
Reliability & Maintainability (R&M): Influences system design through the implementation of policy and guidance to increase mission capability and availability and decrease logistics burden and cost over a system's life cycle. Properly planned, R&M engineering reduces cost and schedule risks by preventing or identifying R&M deficiencies early in development.

Manufacturing & Quality (M&Q): Establishes guidance and procedures to promote manufacturing and quality considerations during the earliest stages of basic research through development, production, operations, and sustainment.

System Safety (SS): Improves the DoD's application of engineering and management principles, criteria, and techniques to achieve acceptable hazard risk within the constraints of operational effectiveness and suitability, schedule, and cost throughout all phases of the system life cycle.

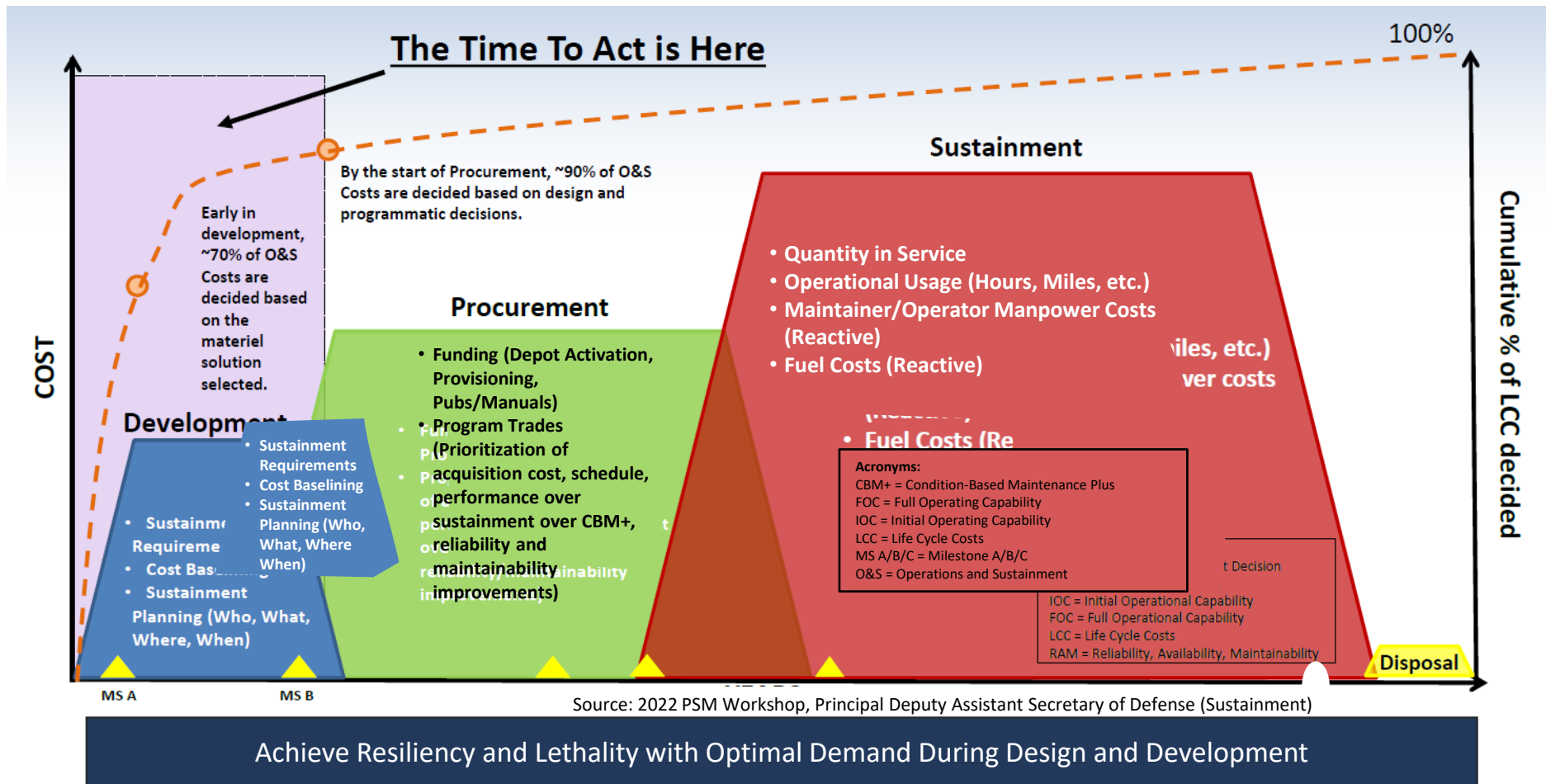
Human Systems Integration (HSI): Instantiates human-centered requirements throughout the acquisition life cycle to optimize total system performance and minimize total system ownership costs in DoD acquisitions.

Value Engineering (VE): Reinvigorates value engineering at the DoD level to improve military worth or reduce acquisition and ownership costs wherever VE is advantageous.



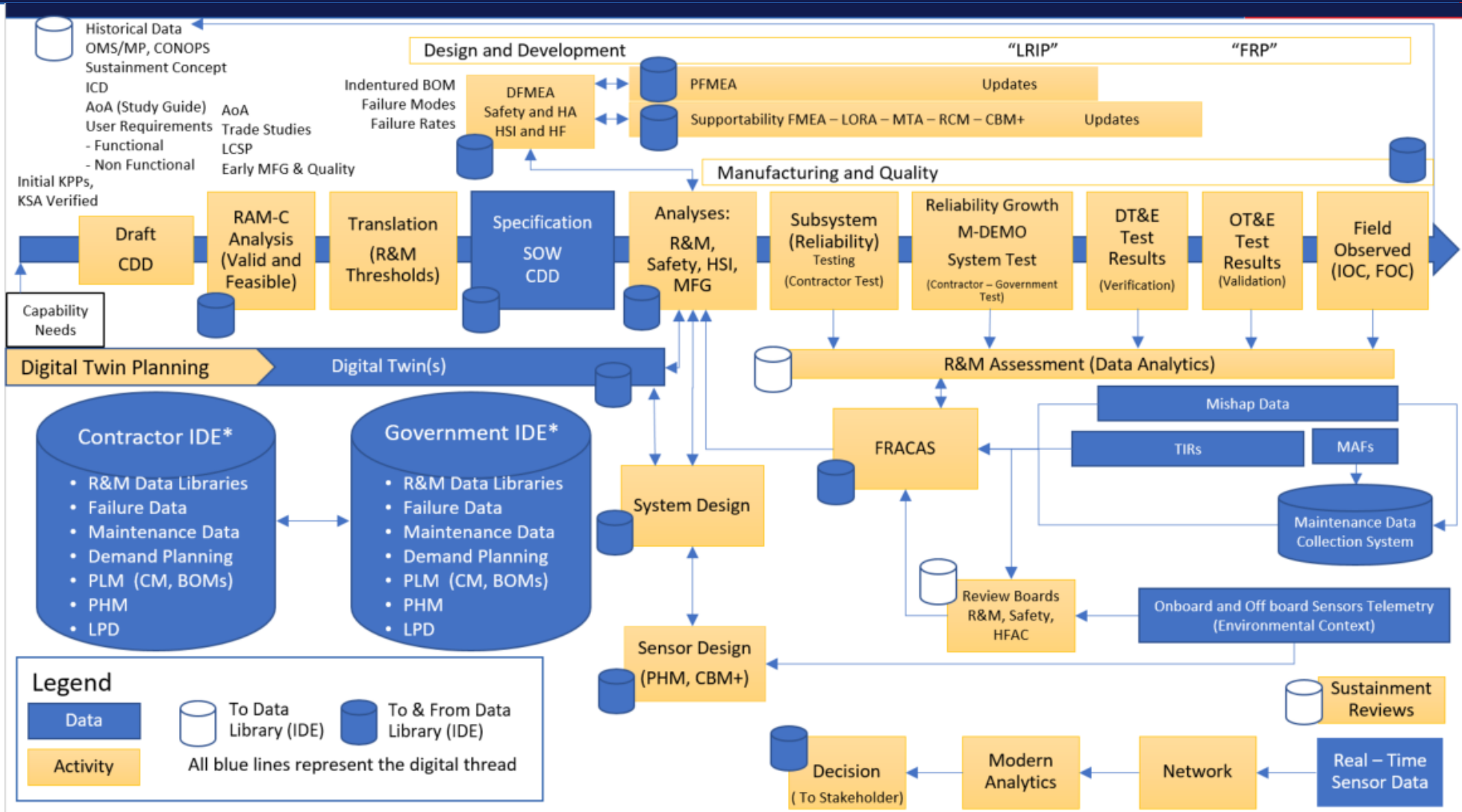


“Bake In” Data During System Design





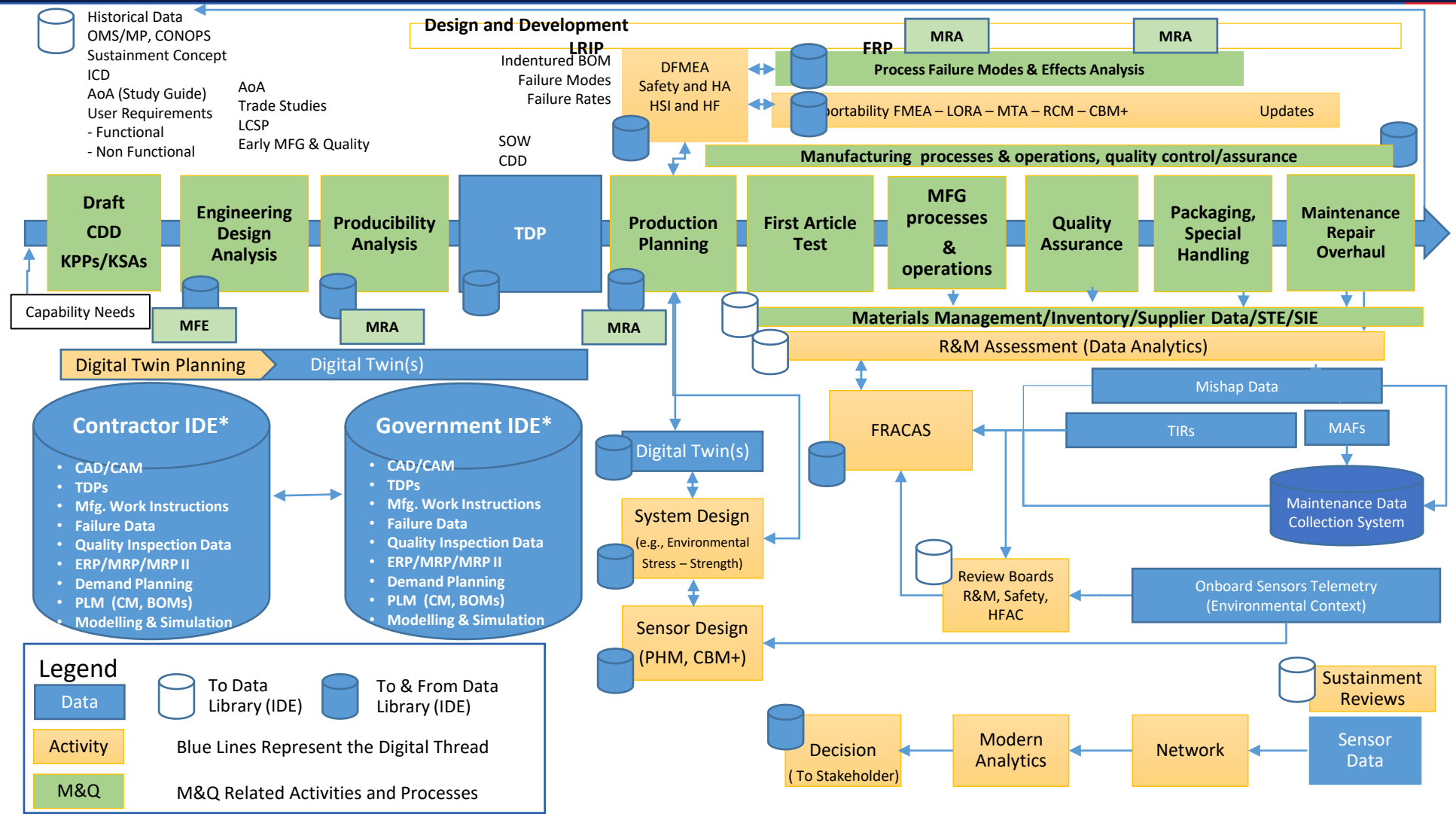
Engineering Data in a DE Ecosystem (R&M View)



*Contractually agreed to content, views, access, and delivery of data.



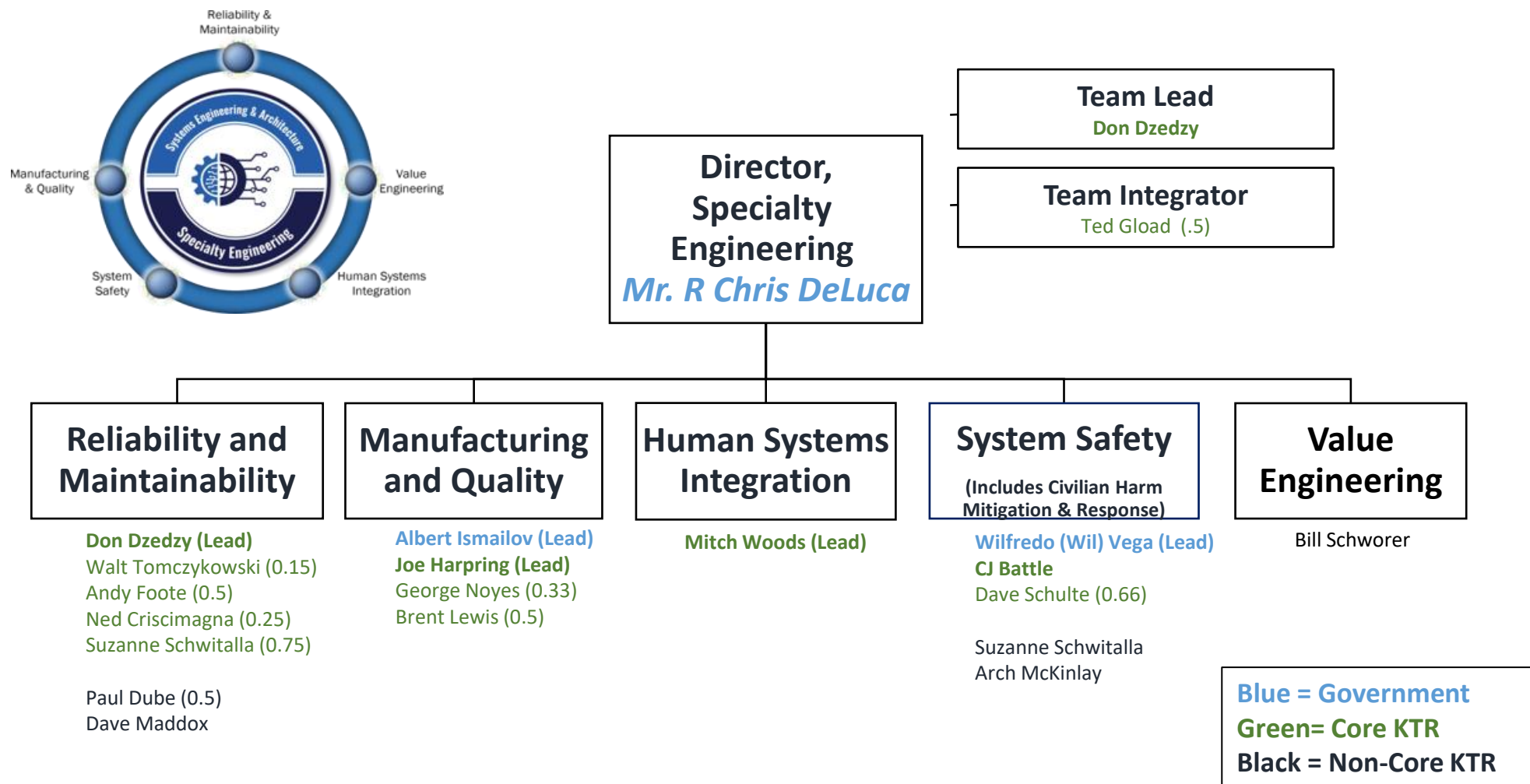
Engineering Data in a DE Ecosystem (M&Q View)



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Specialty Engineering Org Chart

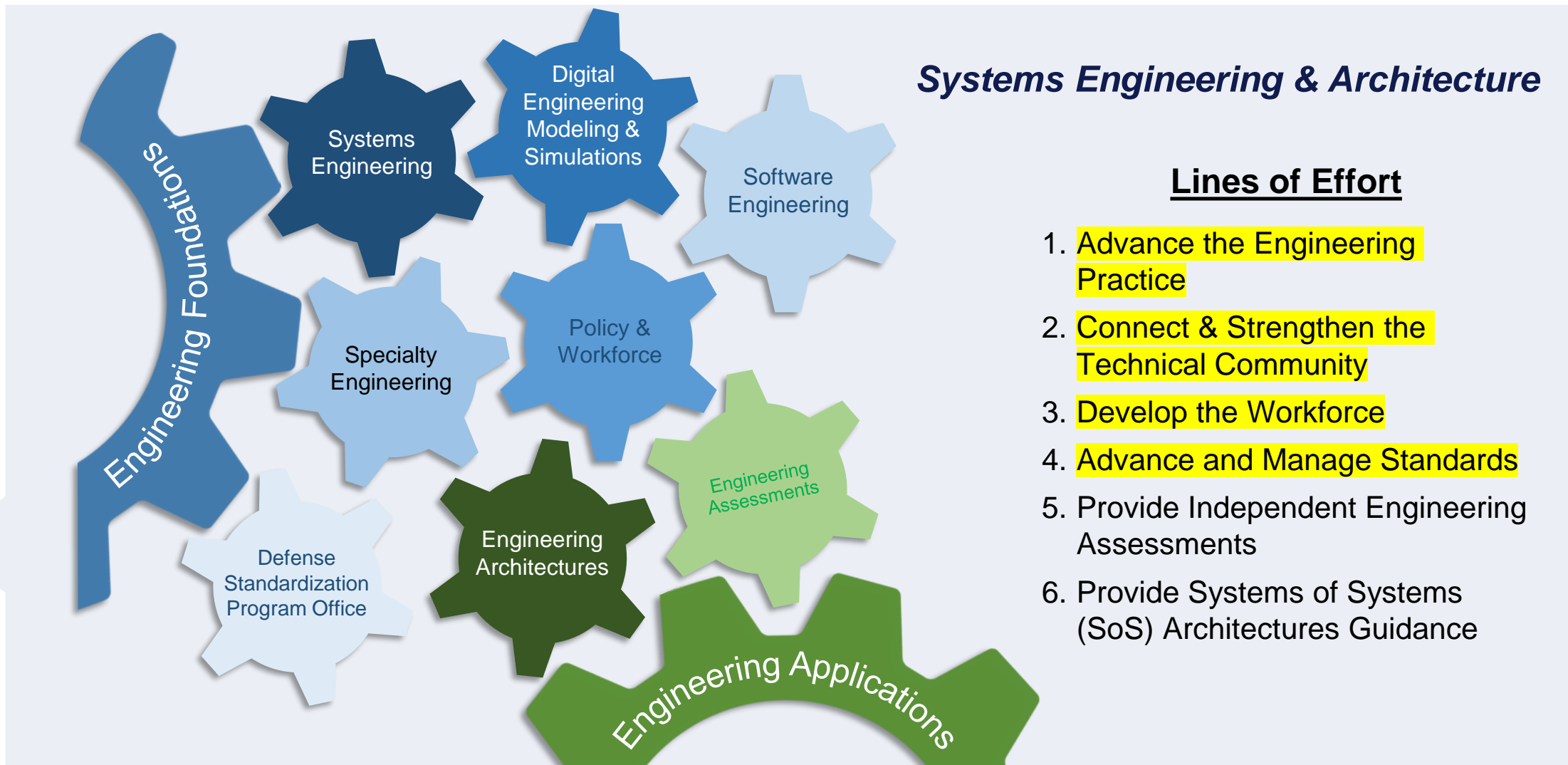




Executive Directorate for Systems Engineering & Architecture



SE&A
Systems Engineering
& Architectures



Systems Engineering & Architecture

Lines of Effort

1. Advance the Engineering Practice
2. Connect & Strengthen the Technical Community
3. Develop the Workforce
4. Advance and Manage Standards
5. Provide Independent Engineering Assessments
6. Provide Systems of Systems (SoS) Architectures Guidance



Specialty Engineering Priorities

INITIATIVES

DoD-Industry R&M and SS Roundtables
HSI Practitioner Tool
VE Management Advisory Group
JSQC – Model-Based First Article Inspection

WORKFORCE DEVELOPMENT

Digital Engineering in R&M Courses
AI R&M and System Safety Courses
HSI and M&Q Credentialing

TECHNOLOGY/PROGRAM SUPPORT

RAI Strategy and Implementation Plan
Additive Manufacturing
MBE FMECA

COLLABORATION (LEAD)

Digital Manufacturing Enterprise
DoD-Industry R&M Engineering Roundtable
MIL-STD-882 System Safety / JSSSWG
Joint HSI Steering Committee / WG
R&M, M&Q Service Leads
VE Management Advisory Group
CHMR-AP Capabilities Development Sub-Working Group
Type Designation and Nomenclature Standards WG

POLICY

DoDI 5000.88 ENG
DoDI 5000.95 HSI
DoDI/M5000.69 WPNS
DoDI 4245.14 VE

GUIDANCE

BoKs for R&M, M&Q, and HSI
Unmanned System Safety Precepts Guide
Engineering of Defense Systems Guidebook
Systems Engineering Guidebook
Producibility & Manufacturability Engineering Guide

STANDARDS

IEEE 1413 Reliability Prediction
IEEE 1624 Reliability Organization Assessment
SAE-1025 Failure Modes Effects Analysis
SAE-6500 Manufacturing Management
SAE-6906 Standard Practice for HSI
SD-24 Value Engineering
MIL-STD-882E System Safety
Type Designation

COLLABORATION (PARTICIPANT)

Focused Sustainment
Defense Safety Oversight Council
Civilian Harm Mitigation and Response (CHMR)
Joint Defense Manufacturing Council
NDIA Digital Manufacturing Working Group
R&M Symposium (RAMS)
DCMA & AIA Qual Surveillance Modeling





Reliability & Maintainability (R&M) LOEs



Policy & Guidance

- Body of Knowledge Update
- BoK AAF Pathway Addendums



Workforce Development

- Instantiating DE in DAU R&M courses
- ENG0900 R&M interface with PS
- AI/ML for R&M DAU Course



Standards

- SAE-1025 FMEA/FMECA
- IEEE-1624.1 Prediction Guidance
- IEEE-1413 Reliability Organization
- Type Designation



Collaboration

- R&M DAU Community of Practice
- DoD – Industry Roundtable
- R&M Engineering Service Leads
- A&S Product Support



Manufacturing and Quality (M&Q) LOEs



Policy & Guidance

- M&Q Body of Knowledge
- Producibility & Manufacturability Guide (Released)



Workforce Development

- Reinvigorate M&Q CoP
- 5 initial M&Q Credentials in work
- Advanced and Additive Mfg Credentials



Standards

- SAE AS6500 Mfg Management
- MIL-HDBK-896 Mfg Management
- Qualification of Additive Mfg Parts



Collaboration

- NDIA Digital Manufacturing Working Group
- M&Q Service Leads
- MRL Working Group
- Digital Manufacturing Enterprise
- DCMA & AIA Qual Surveillance Models



Human Systems Integration (HSI) LOEs



Policy & Guidance

- DoDI 5000.95 HSI
- HSI Body of Knowledge
- HSI Guidebook
- HSI Framework tool



Workforce Development

- ENG 0620 Introduction to HSI
- HSI Credential in work
- DoD HSI Course catalog



Standards

- SAE 6906 Standard Practice for HSI
- MIL-STD-882E System Safety
- ANSI/HFES 400



Collaboration

- Joint HSI Steering Committee
- Joint HSI Working Group
- DAU and APAN CoPs



System Safety (SS) LOEs



Policy & Guidance

- DoD Manual 5000.69
- Unmanned Systems Safety Engineering Precepts for Acquisition Manual
- ML System Safety Engineering Handbook (FY24 -25)



Workforce Development

- DAU SS Courses:
 - AI System Safety Engineering I
 - AI System Safety Engineering II
 - Software System Safety Engineering (Funded)
 - System Safety Engineering Basics (FY25)



Standards

- MIL-STD-882E Update:
 - w/CHANGE-1
 - Gaps and Priority Assessment
 - Use of NGSs with technical merit



Collaboration

- Joint System Safety Standards WG co-Chair
- DoD Acquisition ESOH IPT WG
- DSOC Working Groups
- DoD Industry SS Roundtable - Pain Points

System Safety Design Order of Precedence: Eliminate hazards through design selection, Reduce risk through design alteration, Incorporate engineered features or device, Provide warning devices, Incorporate signage, procedures, training, and Personal Protective Equipment



Value Engineering (VE) LOEs



Policy & Guidance

- DoDI 4245.14



Standards

- SD-24



Collaboration

- VEMAG



Contact Info

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<https://www.cto.mil>

<https://ac.cto.mil/engineering>



Backup



Legend		E (CD)	HSI (MW)	M&Q (AI/SG)	R&M (DZ)	SS (WV/DS)	VE (PD/WS)
Red - Critical	ort		JHSISC Meeting/Exec Sec Activity	DME Workshops/Recs	AI R&M Course Content	AI Safety Course Content (WV)	DODI 4245.14
Purple - UFR Funded / Visible	AI Project		HSI Framework Tool	JDMC Recommendations	ENG 0900 Support	DODI 5000.69	SD-24
Brown - Important			IMPRINT Maintenance	MxD Evaluation	MBE FMECA DID	DoDM - UxS Safety Eng Precepts Manual	VE ESG
Black - Other SpE Priority	abilites		Practitioner Symposium	Producibility Guide	DAU AI in R&M Webinar (Sept 24')	ISSC Gov/Ind Roundtable/Panel Pain Point	
Green - Complete	Develop Sub-WG		DAU HSI Credential	AM Qual/Cert Study	BoK PS Update	DAU Webinar	
	5 NAS A&S R&E Memo		ENGR 062 Update	DAU Webinars x2	RAMS Panels + Roundtable	MIL-STD 882E - Co Lead JSSSWG - CH-1 CHMR - ID Gaps and Priorities - RFI NGSBs	
	6 DE MIL HDBK Input		BOK/COP Maintenance	DAU M&Q Credentials	R&M Service Leads (Bi-Monthly)	DODI 5000.69	
	7 ENG CoP Maintenance		UFR Path Forward	DAU COP Update	MTA Addendum	ISSS Summit and Trianing DoD events (track, panel, roundtable)	
	8 ENG CoP - Design Considerations		CBA FY23 Update Planning	BOK Update	SWE Addendum		
	9		Influence Standards	R&E SpE Website Maint.	UCA Addendum		
	10		DAU HSI Webinar	MIL-HDBK-896	SAE 1025 FMECA		
	11		STRATCOM Briefing	MRL WG	DAU R&M CoP Maintenance		
	12			M&Q Service Leads	R&E SpE Website Maint.		
	13			DMC 2023	Instantiate DE DAU support		
	14			CQSDI Briefing	Focused Sustainment May 23 DMAG		
	15				Focused Sustainment Nov 22 DMAG		
	16				RAMS 2024 Theme		
	17				MCA Addendum		
	18				AvMC SW Language		
	19				ENG 0900 GFI		
	20				Instantiate DE GFI to DAU		
	21				DE in R&M Webinar		
	22						