



Air Force Materiel Command



Software Development Challenges in AFMC (Agile Software Development and Data Rights) Abstract # 19902 25 Oct 2017



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Breaking Barriers ... Since 1947



Outline

- **Introduction (Dr. Marc Shaver)**
- **HQ AFMC/EN ASD Questionnaire Results (Mr. Andrew Jeselson)**
- **AFLCMC/EN-EZ Agile Software Development (ASD) Workshop (Mr. Curtis Jefferson)**
- **AFLCMC/EN-EZ SW Data Rights Strategy Process (Mr. Curtis Jefferson)**



Introduction

- **The Air Force Engineering Enterprise led efforts identifying knowledge, skills, and process gaps within the workforce**
- **Two software related topics were:**
 - **Awareness of Agile, Flexible SW Development & Sustainment Methodology to include Agile SW Development (ASD)**
 - **Software Data Rights Strategy process**
- **AF Life Cycle Management Center (AFLCMC), with AF Materiel Command (AFMC) support, leading efforts to address these topics**
- **A key initial outcome of these efforts is the requirement to develop education and training for the engineering workforce**
 - **Education will capitalize on existing DAU and other courses providing basic understanding of ASD and Data Rights**
 - **Focus on AF unique practices, processes, and tools**
 - **Initial concepts under development**



Background

- **ASD**

- **Well understood and widely used commercially and, in DoD Information Technology (IT) and Business System applications**
- **DoD weapon system acquisition now moving to apply ASD**
 - **No standard DoD weapon system specific ASD methodology or training**
- **AFMC Engineering Council tasked AFMC/EN to study ASD to define scope and types of ASD employed and associated training**
- **AFLCMC also interviewed programs to gather ASD lessons learned and best practices**
- **AF pursuing weapon system specific ASD education addressing:**
 - **Implementation approaches, barriers and enablers, weapon system specific ASD challenges/problems/successes, and other management considerations**



Background (con't)

- **Software Data Rights Strategy**
 - **Data rights vital for life cycle management**
 - **Programs need to carefully consider appropriate Software Data Rights, especially related to sustainment, early in program's lifecycle**
 - **AFLCMC/EN-EZ developed a standard process for producing an Intellectual Property (IP) Strategy for Weapon System Software**
 - **Repeatable process that produces SW Data Rights strategy**
 - **Provides consistent approach for identification, justification, and documentation of the program's SW data rights; and assures persistence of the software data rights procured over program life cycle through early and continuous participation of government organic SW support agencies**
 - **AFLCMC has codified the SW Data Rights Strategy as a standard process**



Agile Software Development (ASD) Questionnaire

Background

- ASD has existed for decades for commercial and some DoD IT and Business System applications -- commercial training is available
- DoD weapon system acquisition and sustainment efforts are now applying ASD, however, there is no weapon system specific ASD training available to address unique DoD ASD applications

Issues

- ASD Training Action Item was assigned at 25 Feb 16 AFMC Engineering Council (EC) to:
 - ID programs/efforts that are using ASD Methodologies
 - ID ASD Training Needs & Gaps
- Stood-up cross-Center ASD SME team: EC members assigned SMEs for their Center
- ASD Questionnaire sent to cross-Center ASD SME team

Bottom Line

- 17 Nov 16 EC: Received ASD Training Questionnaire responses from cross-Center ASD SME team members. HQ AFMC/ENS and AFIT/LS personnel reviewed, consolidated, and analyzed the responses. The results indicate there is a pervasive need for ASD, and especially SCRUM training. The responses helped determine ASD Training Needs/Gaps and support development of Air Force ASD Training Plan.
- Upon your request, the ASD Questionnaire can be delivered to you
 - Contact Mr. Andrew Jeselson, HQ AFMC/ENS, andrew.jeselson@us.af.mil



HQ AFMC/EN ASD Questionnaire

Samples of Data Collected

Data Collected

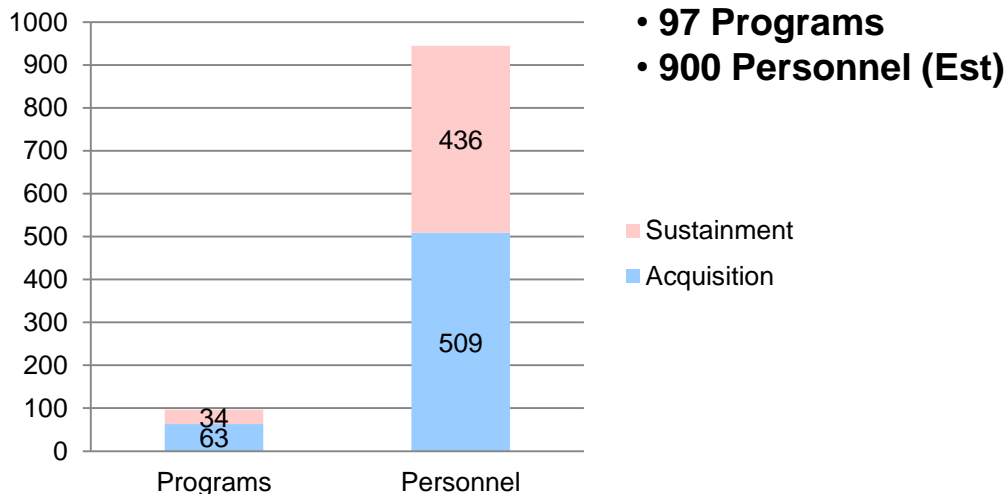
- Program identification data
- Type of ASD employed
- Current training expenditures
- Future training requirements

Center	Program Name	Kind of Program	Program Phase using ASD					Type of ASD	Total # Personnel	Training Offered	Training Needed	Current Expenditures
			MS A	TD	EM D	PD	OS					
	JWS	Business/IT					X	Scrum	0	N	Y	
	F-22	ACWS					X	Safe	20			
	B-2	ACWS					X	Cont Integration	?	Y	Y	
	CRH	Weapon System			X			Scrum	?			
AFSC 76 SMYC Tinker AFB	B-1 Mission Planning	Development/Maintenanc					X	Scrum	12	Y	N	\$ 5,000
	TBA-FAAB	Business/IT application program					X	SCRUM	4			
	TBA-FMR	Business/IT application program					X	SCRUM	4			
AFTC/4	COOL	Operations cent program					X	SCRUM	3			
	TBA-MRTFB	Business/IT application program					X	SCRUM	4			
AFRL/ RX	ICE – Integrated Collaborative Environment	Laboratory Program – for internal use	X					Scrum, RUP, Kanban, Extreme Programmin g	3	N	Y	

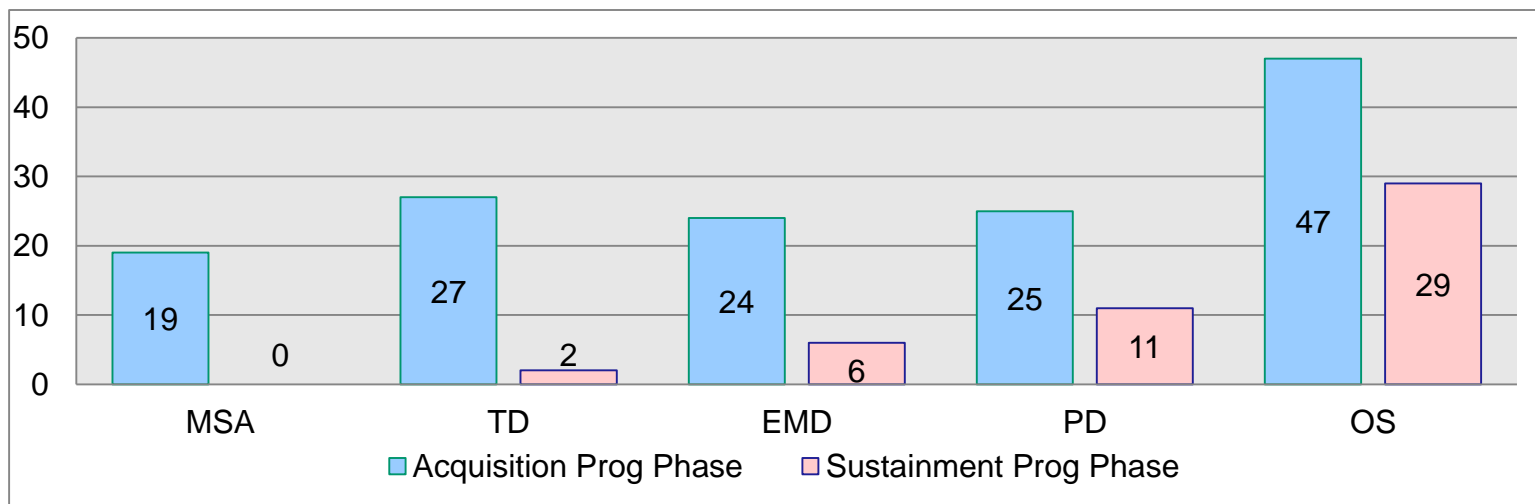
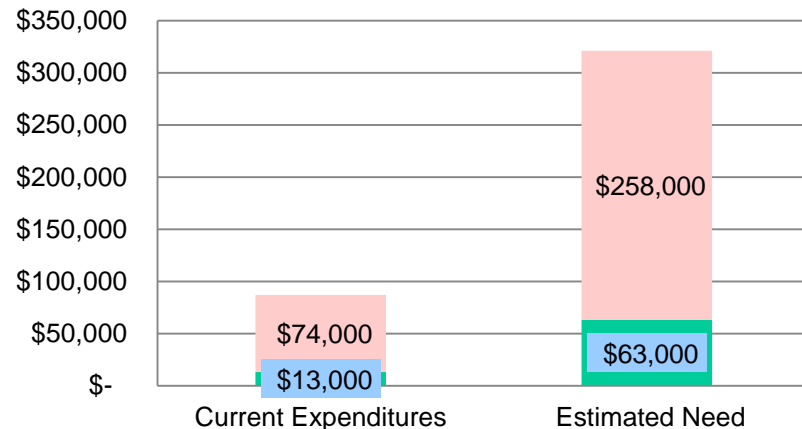


HQ AFMC/EN ASD Questionnaire Results

Personnel and Programs



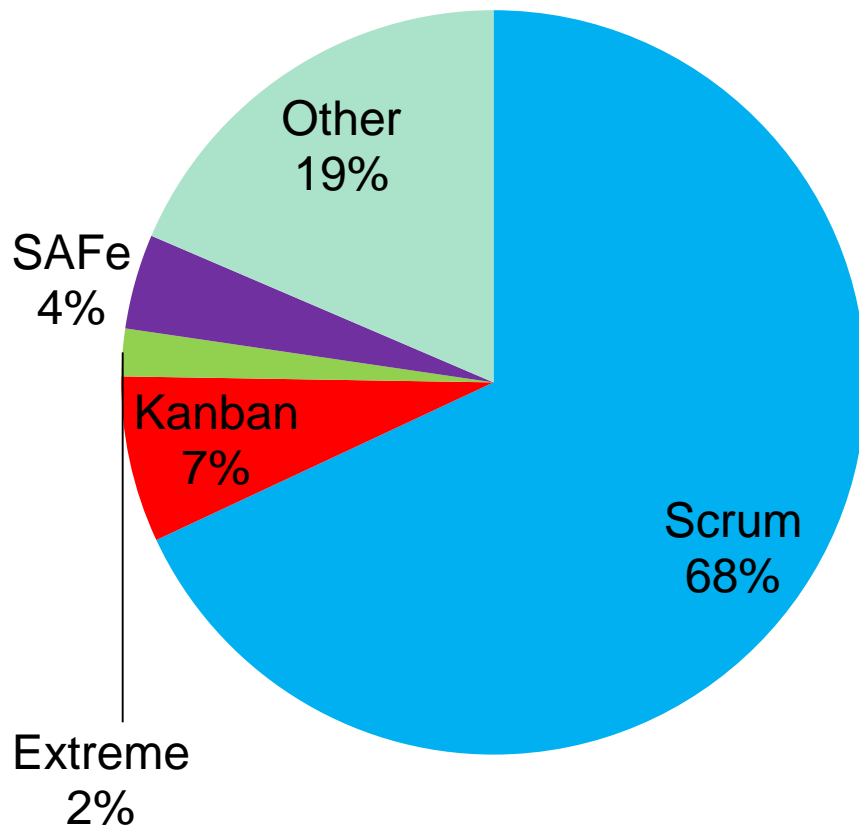
Agile Training Reported Funding





HQ AFMC/EN ASD Questionnaire Results (con't)

ASD Techniques in Use



Assessment:

- Many Air Force organizations are pursuing their own education
- AFMC has a need for enterprise level agile education
- AFIT/LS assisted with gap analysis and ASD course development
- More educational gap analysis is required; however, some tailored courses are likely to be needed
 - SMC/EN funds a Software Engineering Institute (SEI) ASD for Government programs course for SMC ASD training
 - AFLCMC/EN-EZ is developing an ASD workshop



AFLCMC/EN-EZ Agile Software Development (ASD) Workshop

Guidance For Agile Avionics SW Development

How do I apply software engineering in an ASD environment?

How do can I support the PM's needs?

How can I track development progress in terms of functionality (Value!)?

How can I handle early discovery of issue?

How should I communicate with the contractor

How can I include the customer (e.g. war fighter, flight test, operational test, etc.)

How can I track development progress in terms of SWE (e.g., moving data throughout the SW system)?

Metrics!



Guidance For Agile Avionics SW Development

■ Issue

- Lack of guidance to help AF POs incorporate/transition agile SW procedures into the acquisition process
 - How to meet the intent of the of AFI 63-101
 - How to satisfy requirements of other processes (i.e., EVM)
- Industry has pushed agile based SW development processes

■ Goal

- Establish agile aircraft systems SW development guidance & training focused on needs of the PO personnel
- Establish best practices
- Guidance on technical reviews
- Understanding elements that impact cost, schedule, & performance
- Etc.

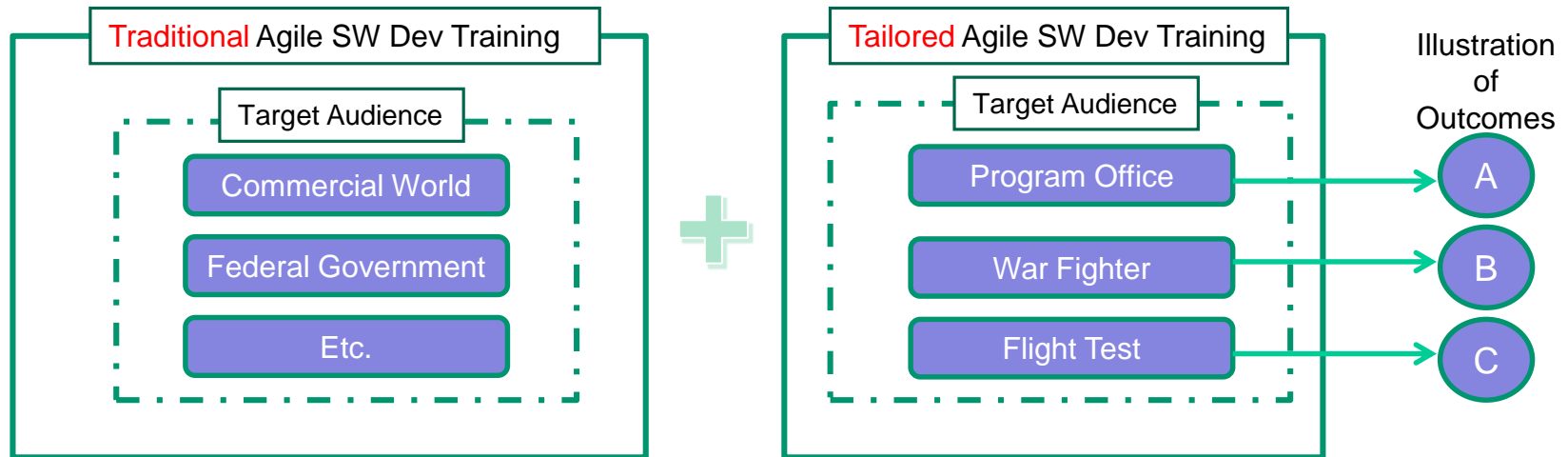


Agile Avionics SW Development

■ Status

- **Commenced active participation in the Software Engineering Institute Agile Collaboration**
- **Active membership in the NDIA Agile Working Group**
- **Continuous involvement in the F-22 implementation of Scaled Agile Framework**
- **Working with AFMC/ENS, SEI, and AFIT to establish training focused on the needs of the personnel in the imbedded avionics systems programs**
 - **Material based on best practices and lessons learned from participation in the above working groups and observations from F-22, B-2, F-15, and other programs**
 - **Including updated materiel in existing focus week training**

Develop Training Tailored for DoD Aircraft Programs



- Illustration of agile tents aligned with DoD System Engineering
- Sample metrics to track SW development progress
- Approach to satisfy earned value management requirements
- Subset of documents generated for government accountability
- Early sustainment posture
- Etc.

—Expected role, availability . . .
—Etc.

—Examples of impacts to flight testing
—Etc.



AFLCMC/EN-EZ SW Data Rights Strategy Process



Improve Acquisition of SW Data Rights

■ Issue

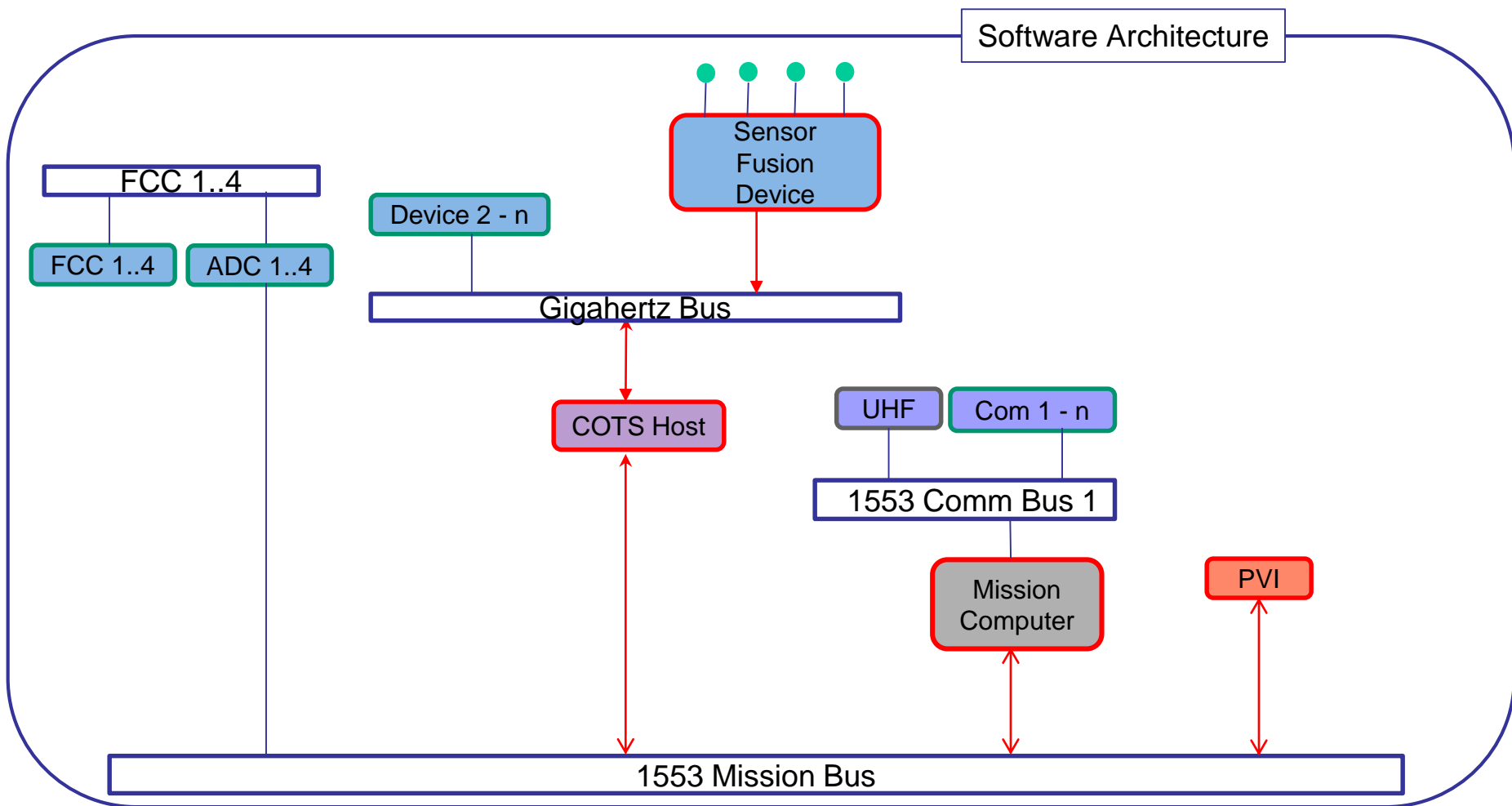
- **Non-availability of program SW data rights for sustainment – assertion supported by:**
 - **2011 AF Studies Board & Scientific Advisory Board reports**
 - **Table top discussions with 10 plus AFLCMC programs**
 - **No analysis executed to ID appropriate SW data rights**

■ Goal

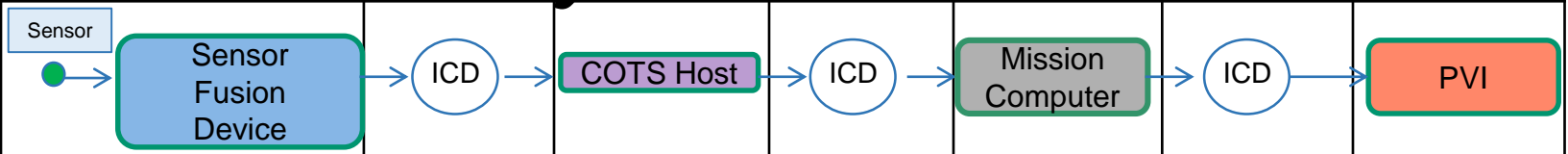
- **Develop standard engineering analysis framework designed to ID, acquire, document, & retain appropriate SW data rights**
 - **Framework to include provisions for timely acquisition of government subject matter expertise congruent with utilization of acquired SW data rights**
 - **Cross organizational involvement (LCMC & AFSC) critical**
 - **Framework tenets included as part of core competency**



SW Data Rights Analysis Example: Isolate Mission Thread



SW Data Rights Analysis Example: Analyze Thread Elements



LRU/ICD	Sensor	Sensor Fusion Device	ICD	COTS Host	ICD	Mission Computer	ICD	PVI
Expected Change Rate	Low	Low	Low	Low	Low	High	Mod	High
Gov't Development Funded	0%	100%	0%	100%	100%	100%	100%	100%
SW Type	Complex Algorithm	N/A	COTS SW	N/A	OFF	N/A	OFF	OFF
...								
Expected Rights	Restricted	Unlimited	COTS SW	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited
Needed Rights	TBD	GPR	COTS SW	GPR	GPR	GPR	GPR	GPR
Current Rights	Restricted	GPR	COTS SW	GPR	GPR	GPR	GPR	GPR
Comments	Needed rights pending analysis of winning bid	See fusion device				Organic Support	Organic Support	Organic Support

**Life Cycle
SW Data Rights Analysis
Framework**

**Acquisition/Sustainment
of
Software Data Rights**



Includes

**Acquisition/Sustainment
Of
SW System
Subject Matter Expertise**





Training

- **Focus Week course**
- **Course material developed via SEI**
- **AFIT course in works**



Questions?

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