Joint Test & Evaluation
Methodology Transition (JTEM-T)

Mission Decomposition

An Approach to Enhanced Mission-Based Testing

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Purpose

- What leads to a successful mission effectiveness assessment?
- How do you set yourself up for a successful design of experiment?

- I'll describe how a mission decomposition process leads to
  - Successful mission effectiveness assessments
  - Improved test design and design of experiments
  - Enhanced mission-based testing

- I'll provide an overview of a structured mission decomposition using the *Measures Development Standard Operating Procedure (SOP)* process steps as an example

Mission Decomposition
What is it?

- Methodology for understanding the contribution of a system under test (SUT) to the system-of-systems (SoS), task, and mission
  - Enables quantitative measurement of system and task(s)
  - Offers the ability to qualitatively evaluate the mission
- Disciplined and repeatable process for developing relevant mission, task, and system measures
  - Documented, methodical, and thorough
  - Therefore, it is not reliant on corporate knowledge
- An objective mission-based approach to designing vignettes
- A process to enhance requirements generation, capability development, and testing

Focused on the ability of the warfighter to perform tasks and achieve mission desired effects

Mission Decomposition
So What?

- Moves the focus from a "systems only" approach to one that deliberately addresses task and mission
- Enables sufficient conclusions of a system's impact on combat mission effectiveness
  - Decomposes a warfighting mission
  - Traces system, task , and mission relationships to warfighter requirements
- Enhances mission-based testing
  - Understanding the mission and task(s) enables better understanding of the system contribution to the warfighter and the mission
  - Better definition of test priorities (critical vs. "nice to have" measures)
  - Helps confirm that an identified gap has been successfully addressed
    - System-specific attributes alone will not do this

Identifies the right measures to answer the right questions at the right time

Mission Decomposition
An Enabler for DOE

- Assists with defining the problem
  - Based on a capability gap derived from a mission/task analysis
  - Mission, effects, capabilities
- Helps determine dependent and independent variables
  - Measures of mission effectiveness and task performance
  - Conditions of the environment, threat, and joint
- Scopes test design directly to the SUT capability gap
  - Leads to evaluating warfighter gap(s)
  - Supports scenario/vignette selection
  - Drives data requirements, test methods, and resource requirements
- Places focus of the design on warfighter requirements

"Not everything that can be counted counts and not everything that counts can be counted." – Albert Einstein

Mission Decomposition
Major Elements

Does your evaluation approach provide a way to determine system impact on task and mission?

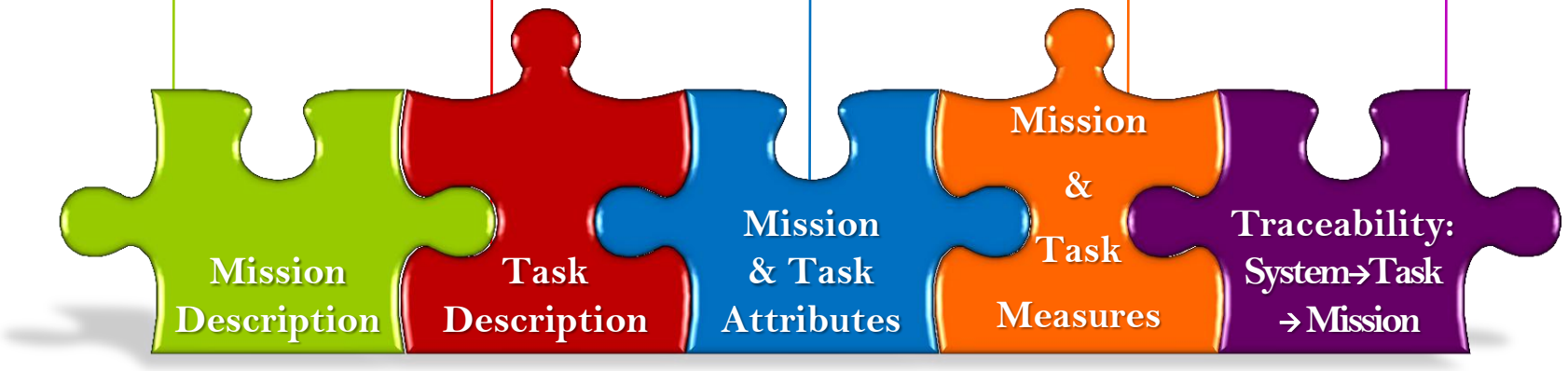
- Mission Statement
- Objectives
- Desired Effects

- Tasks
- Sub-tasks
- Nodes

- Desired Effects attributes
- Task attributes
- SWarF attributes

- Attribute measures for mission and tasks

- Traceability of system attributes to task and mission desired effects



Mission Description

Describe the mission in terms of objectives and desired effects (outcomes).

- Identify the Mission Statement(s), Objectives and Desired Effects from authoritative sources:
  - JCIDS documents (ICD, CDD, CPD)
  - Analysis of Alternatives
  - Joint Mission Thread (if available)
  - Joint/Service Doctrine/CONOPS
  - SME input

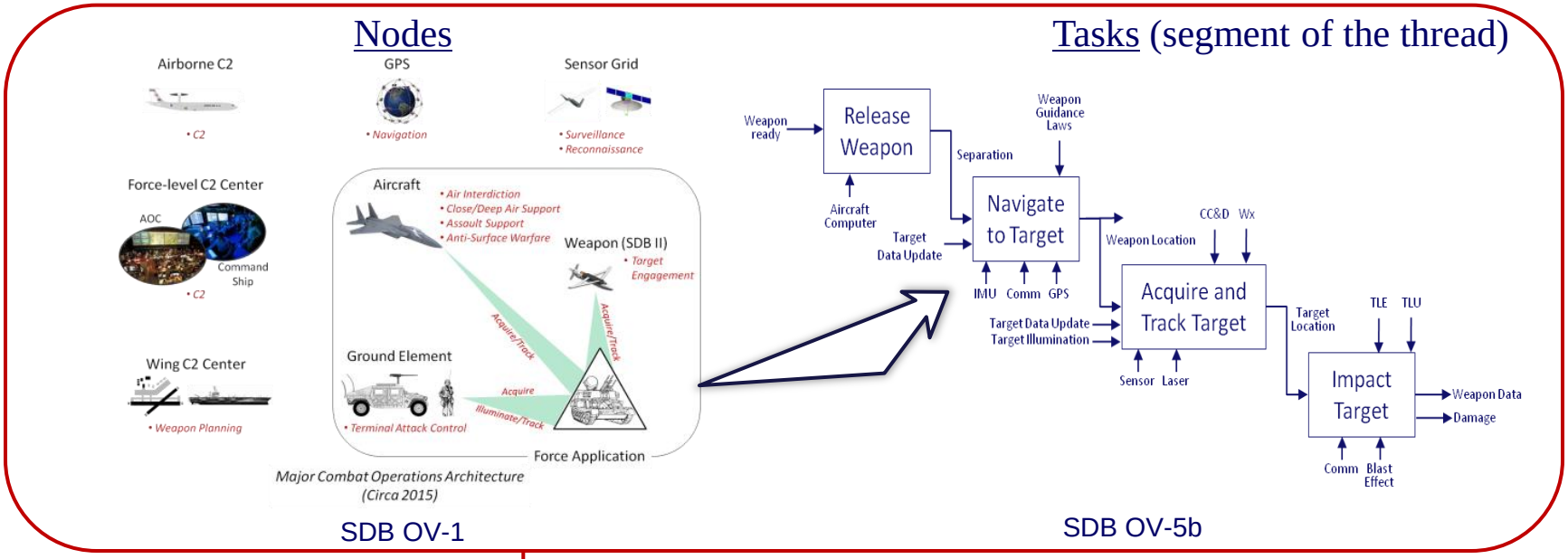
Task Description

Decompose the mission into relevant tasks.

- Mission(s) decomposed to tasks (activities) and sub-tasks with key nodes identified
  - Functional performers/roles identified that perform the mission
  - Nodes identified as the "means" to performing tasks (e.g. from DoDAF products, joint mission threads, joint publications, CONOPS)
  - UJTLs and Service task lists may be included

Task Description
Example

Decompose the mission into relevant tasks.



Mission & Task Attributes

Identify the attributes (characteristics) of desired effects and tasks.

- Important and relevant characteristics of Desired Effects and Tasks are identified
- JCIDS prioritized list of capability attributes for enabling JCAs (the SWarF list: Battlespace Awareness, C2, Net-centric, Logistics)
- Dimensions of performance attributes (time, space, quality, action, etc) are directly linked to task and sub-task descriptions

Mission & Task Attributes
Example

Identify the attributes (characteristics) of desired effects and tasks.

	Task/Sub-Task Attributes			
Operational Task/Sub-Tasks	Accurate	Timely	Networked	Lethality
A5. Engage Mobile Target				
A51. Release Weapon		X	X	
A52. Navigate to Target	X		X	
A53. Acquire and Track	X		X	
A54. Impact Target	X			X
A6. Assess Effectiveness	X	X		

Table showing SDB task/sub-tasks vs attributes

Mission & Task Measures

Ensure there are separate measures for the military effect (mission accomplishment), task performance, and system function.

- Mission Measures
  - Should assess an attribute of a desired effect
  - Consists of a scale and a description
- Task Measures
  - At least one measure for each task-attribute pairing (more may be required)
  - In addition to JCIDS, may come from the joint/service task lists (UJTL, UNTL, etc)

Mission & Task Measures
Example

Ensure there are separate measures for the military effect (mission accomplishment), task performance, and system function.

Objectives: 1) Achieve battlefield effects against Mobile Targets 2) Minimize Undesired Effects						
	Measures					
Attributes	Percent of actions where CAS was employed and effectively reduced risk to attack	Time to effectively conduct CAS against mobile targets	Percent of CAS missions where fratricide (including bodily harm) occurred as a direct result of CAS	Percent of CAS missions where collateral damage from CAS was acceptable	Percent of systems integration that are successful	
Precision	X		X	X		
Lethality	X					
Timeliness		X				
Flexibility	X				X	

	Task/Sub-Task Measures								
Attributes	Impact distance to center of target	Probability of Single Shot (Pssk)	Pct post release comm acknowledge	Pct successful target updates & retargeting	Pct successful weapon location updates	Pct successful weapon aborts	Avg delta in actual target location & weapon data target location	Pct accurate Bomb Hit Indication reports	Avg time to correctly assess BDA
A52. Accuracy							X		
A53. Accuracy							X		
A54. Accuracy	X						X		
A61. Accuracy								X	
A61. Timeliness									X

Mission/Task/System Traceability

Ensure system attributes are traceable to task and mission.

- The ICD has a Capability Gap table that connects capabilities (task-based) with attributes and metrics (standards for assessment)
- Look for a connection between the measured system attributes (KPPs, KSAs, others) and the capability gap as expressed in the ICD

Mission/Task/System Traceability Example

Ensure system attributes are traceable to task and mission.

Priority	Tier 1 & 2 JCA	Description	Measure	Minimum Value	KPP, KSA, other attributes
1	e.g. Force Application Engagement	Capability 1			
		--Attribute 1	Description	Value	6.1, 6.2
		--Attribute *n*	Description	Value	6.2, 6.3, *n*
2	e.g. Force Application Engagement	Capability 2			
		--Attribute 1	Description	Value	6.1, 6.2. 6.3
		--Attribute *n*	Description	Value	6.4, 6.5, *n*

ICD Capability Gap table with system attributes traced to task.

Mission Decomposition Benefits

- Disciplined, repeatable, and sufficient process for developing mission, task, and system measures for testing
  - The *Measures Development SOP* provides this process
- Enables objective understanding of a system's contribution to the SoS, task performance, and mission effectiveness
- Provides traceability to warfighter requirements
- Enables validation of capability gap closure
- Moves the focus from "system only" to task and mission
- Helps design tests in accordance with the mission
- An enabler for Design of Experiments
- Enhances mission-based test design

Enables sufficient conclusions on combat mission effectiveness

Questions

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