

The 22nd Annual National Test & Evaluation Forum

**Sponsored by the National Defense Industrial
Association Test & Evaluation Division**

March 6, 2006

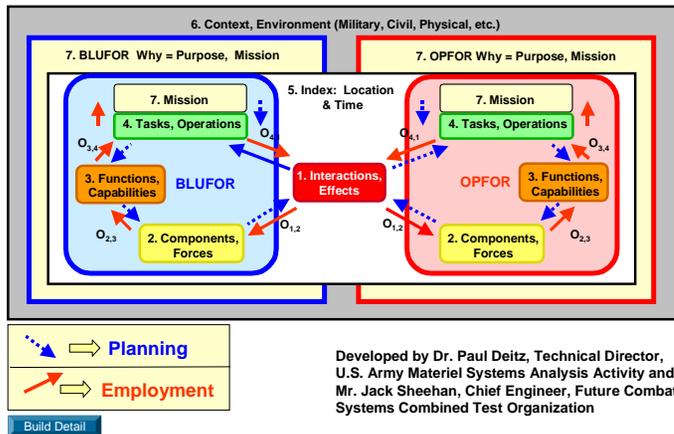
Tutorial
**Putting the MMF to Work to Drive Analysis –
Getting to the “So What” by Asking the Right
Questions About the Mission**

**Held at The Hyatt Regency Jacksonville, Jacksonville, FL, 6-9
March, 2006.**

Outline

Missions and Means Framework Model

11 Fundamental Elements: 7 levels, 4 operators



- Introduction
- Background/MMF Review
- Using MMF to get to the “So What”
- Practical application – How MMF can be applied to ask the right questions and organize the resulting information.
- A few examples of MMF application to T&E
- Conclusion/Summary

Why Develop New Material Solutions?

- A. Because We Can?
- B. Advances in Technology?
- C. To Accomplish Operational Missions Under Changed Operational Environment?

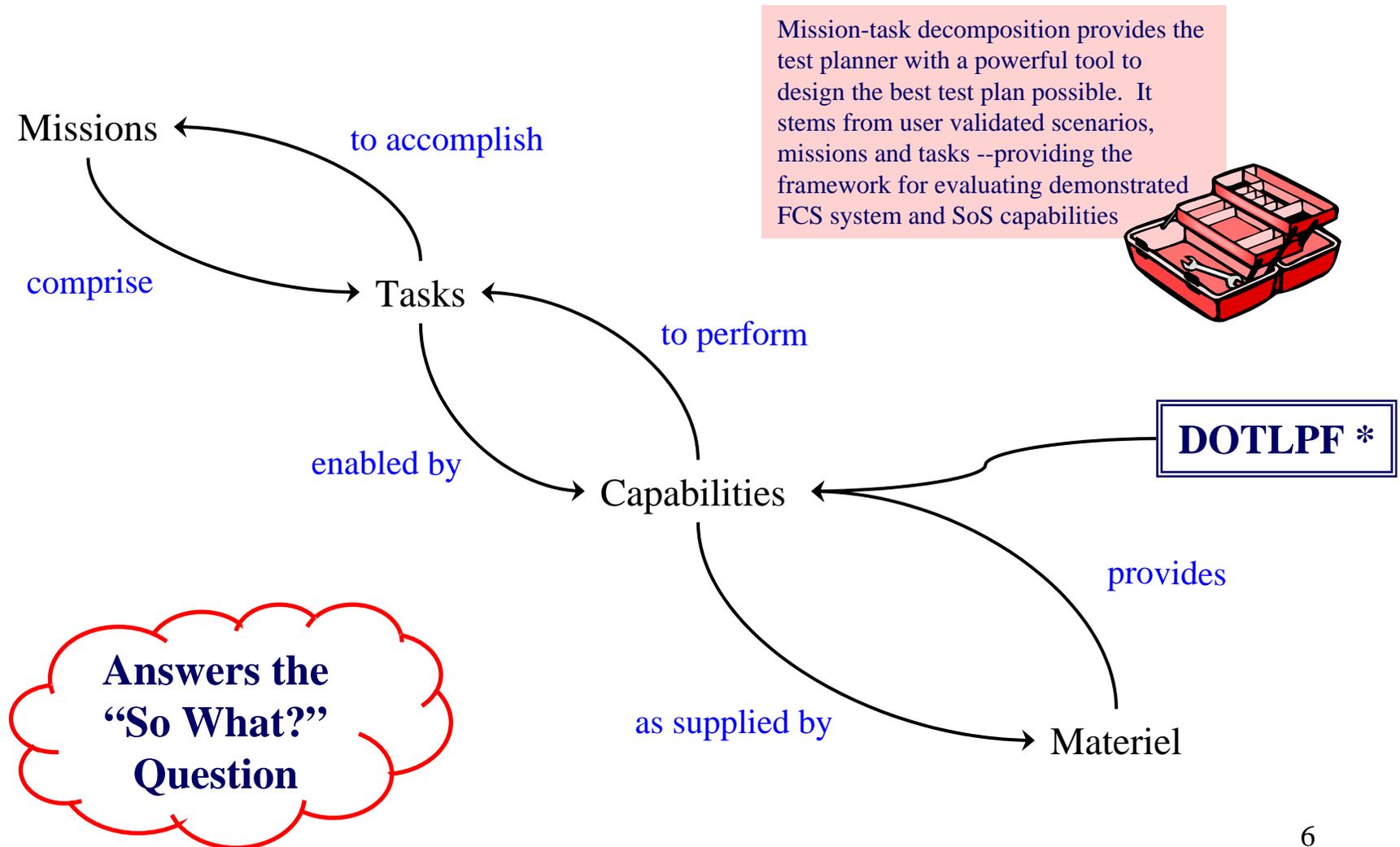
What's Changed?

- A. Network-Enabled Capabilities
- B. Joint Interdependence
- C. Development and Fielding of Systems of Systems

Some Impacts on T&E

- A. How do you Measure Contribution of Individual Parts to Effectiveness of the Whole?
- B. How do you Measure Contribution of Combinations of Parts to Effectiveness of the Whole?
- C. How do you Measure Contribution of Non-Lethal Capabilities to Mission Accomplishment/Effectiveness?
- D. How do you Tie in Planning for and Results of Distributed Test Events to a Single Integrated T&E Plan?
- E. How do you Measure Contribution of Human in the Loop and HSI to Mission Accomplishment/Effectiveness?

ATEC's "mission-to-capability trace"



Missions & Means Framework (MMF)

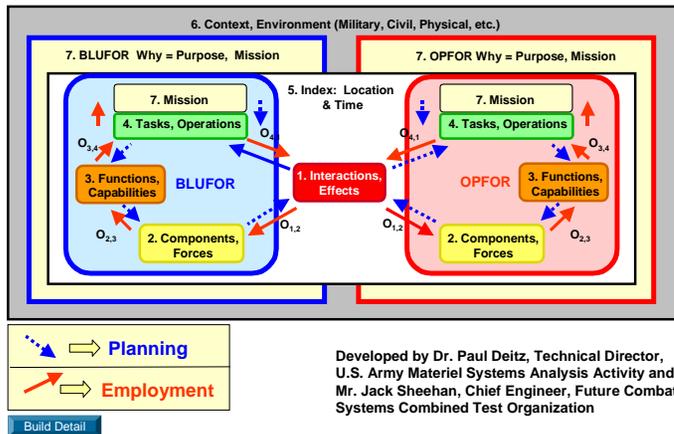
- Purpose:
 - Methodology for explicitly specifying military mission
 - Quantitatively evaluate mission utility of alternative warfighting DOTMLPF* services/products
- Objective: Provide disciplined procedure to explicitly specify mission, allocate means and assess mission accomplishment by:
 - Unifying warfighter, engineer and comptroller understanding of missions and means
 - Accounting for traditional T&E factors and traditional warfighter expertise factors that constitute mission success
 - Being sufficiently credible, timely and affordable to make hard decisions that stay made
 - Being consistent, concise, repeatable and scalable
 - Providing disciplined process to implement SECDEF's transformation guidance and associated acquisition reform.

*DOTMLPF = Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel and Facilities

Outline

Missions and Means Framework Model

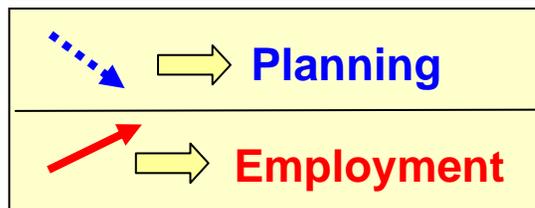
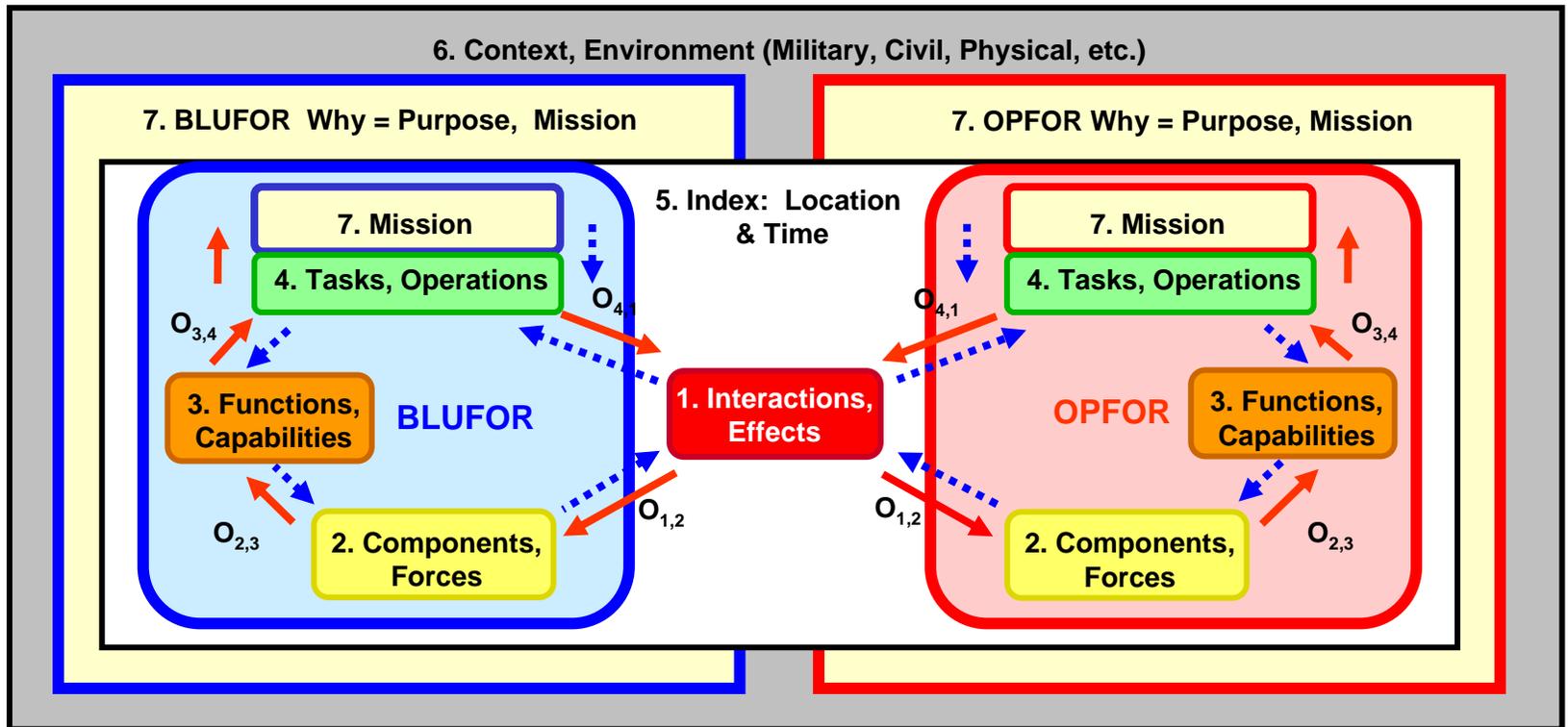
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Missions and Means Framework Model

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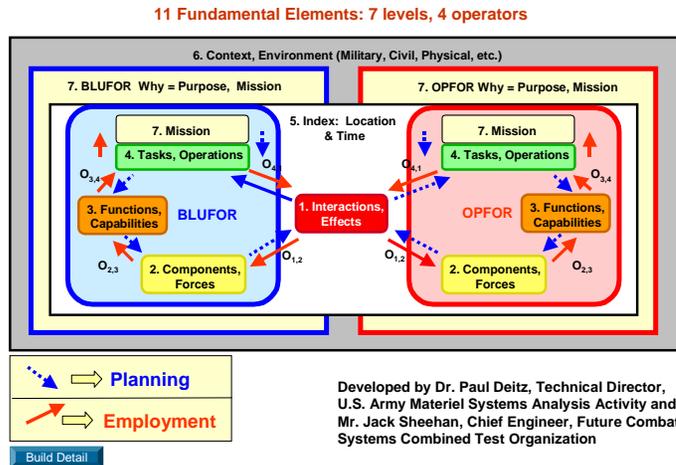


Build Detail

Developed by Dr. Paul Deitz, Acting Director, ARL HRED and Mr. Jack Sheehan, Chief Engineer, Future Combat Systems Combined Test Organization

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Applying the Framework to generate questions about the Mission ...

Framework Level	Level Description in Terms of Military Operations	Questions related to Test and Evaluation
Level 7: Mission, Purpose	What is the Mission Task, Purpose, and Endstate for Friendly and threat forces?	What is the Mission Task, Purpose, and Endstate for friendly and threat forces? What operational scenario is to be used for the test?
Level 6: Context, Environment	What are the conditions under which the mission is to be performed?	What are the environmental factors that will impact on the mission? How do we replicate the appropriate environmental factors?
Level 5: Index, Location/Time	When, in terms of current or future time period and where, in terms of geographic location does the mission occur?	When and where is the mission to take place? What events (Road to War) led to this point? When and where will the test activities take place?

And the Means that lead to...

Framework Level	Level Description in Terms of Military Operations	Questions related to Test and Evaluation
Level 4: Tasks, Operations	What operations and tasks must be performed to accomplish the mission	What types of operations and what tasks must the organization under test perform in order to accomplish the mission? What is purpose for each operation and task? What are the associated MOEs and MOPs? What conditions are in place that could affect task performance?
Level 3: Functions, Capabilities	What functions and capabilities are required to enable successful accomplishment of task purpose?	What functions and capabilities and capabilities are required to enable successful performance of the operations and tasks under identified conditions?
Level 2: Components, Forces	What equipment, personnel and forces are available to provide required functions and capabilities	What components and forces are available to perform the mission and what functions and capabilities do they provide?
Level 1: Interactions, Effects	What interactions must occur to create the desired effect.	What interactions/events must be stimulated/simulated?

T&E Mission Statement

Data Needed	Known Information	Unknown Information
Level 2: Force Listing/TOEL/TDA	Level 2: Components/Forces	Level 5-7: External operational mission
Level 3: Performance/Behavior Function/Capability Desc	Level 3: Functions/Capabilities to be delivered (based on O&O/ORD)	Level 4: Tasks/Operations
Level 4: Task Lists		Level 3: Functions/Capabilities required in this mission
Level 5-7: Opnl Scenario/vignettes		Level 1: Interactions/Desired Effects

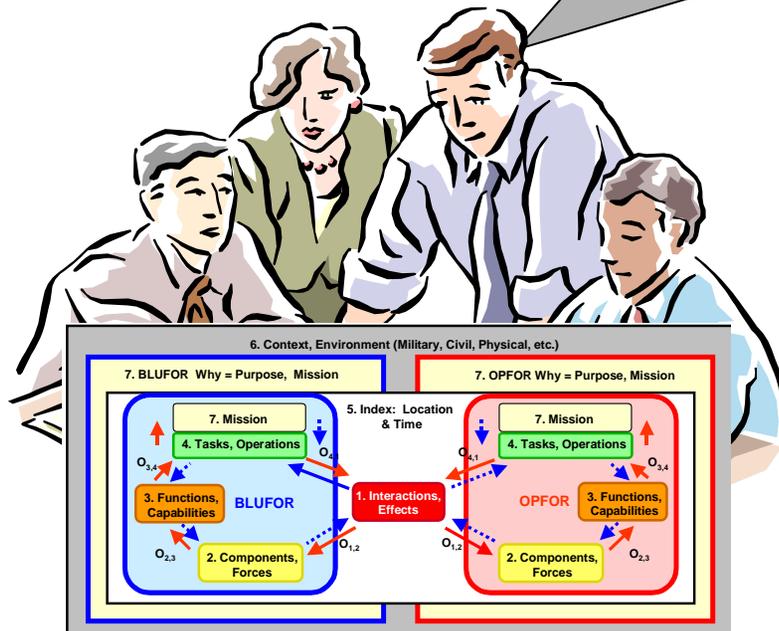
T&E Planning and Coordination Questions

- **Does a suitable scenario exist or will one have to be generated?**
- **What are the most important capabilities to test and evaluate? Under what conditions?**
- **What operations and tasks require the identified capabilities?**
- **What components and forces of the System under test deliver and/or employ the capabilities identified above?**
- **What kind of LVC environment is required to adequately support observation and evaluation of the identified components/forces performing the identified tasks?**
- **Do resources and facilities currently exist to provide the required LVC environment or will some have to be developed?**

Implications for T&E planning

- **Need to develop cross-walk of capabilities to tasks to sharpen focus of observation/data collection plan.**
- **Need to develop cross-walk of selected tasks to executors of tasks.**
- **Need to determine interactions needed to trigger execution of tasks.**
- **Need to maintain coherent mission thread for vignette being run in order to determine and trace mission impact of task success or failure (i.e. establish an audit trail).**
- **Need to determine minimum level of granularity required for meaningful execution (test) and evaluation.**
- **Need to structure test support plan to enable execution, observation and data collection of test events at the required level of granularity.**

So how do we make this work?

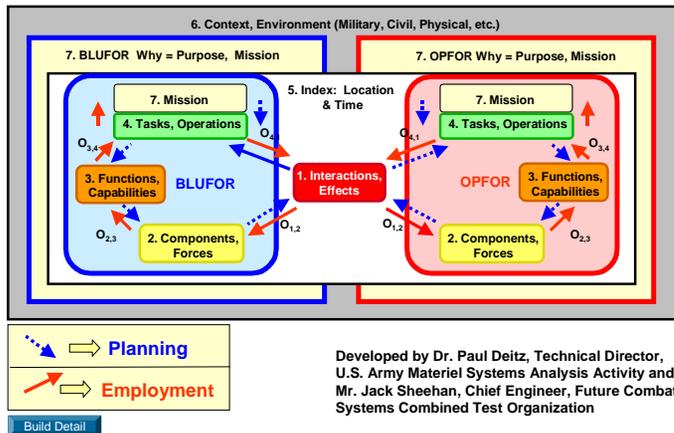


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Missions and Means Framework Model

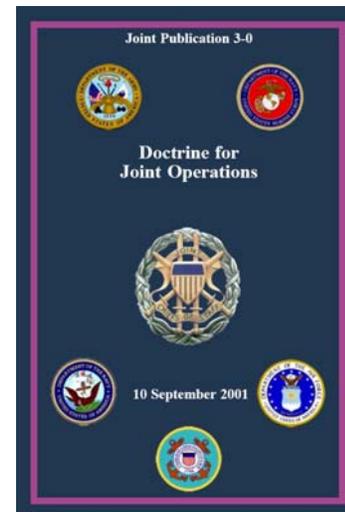
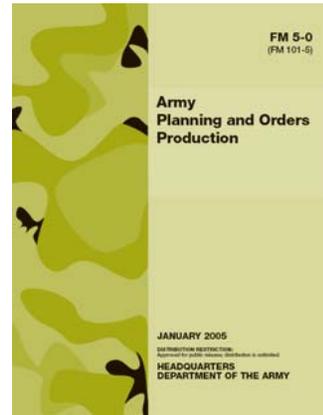
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MMF Builds on Doctrinal Processes

- MDMP
 - Mission Analysis
 - COA Development
 - Wargaming
- Operations
- Training & Readiness
 - JTS Phases
 - JMETL/METL Development and Assessment



The MDMP – Its About the Mission

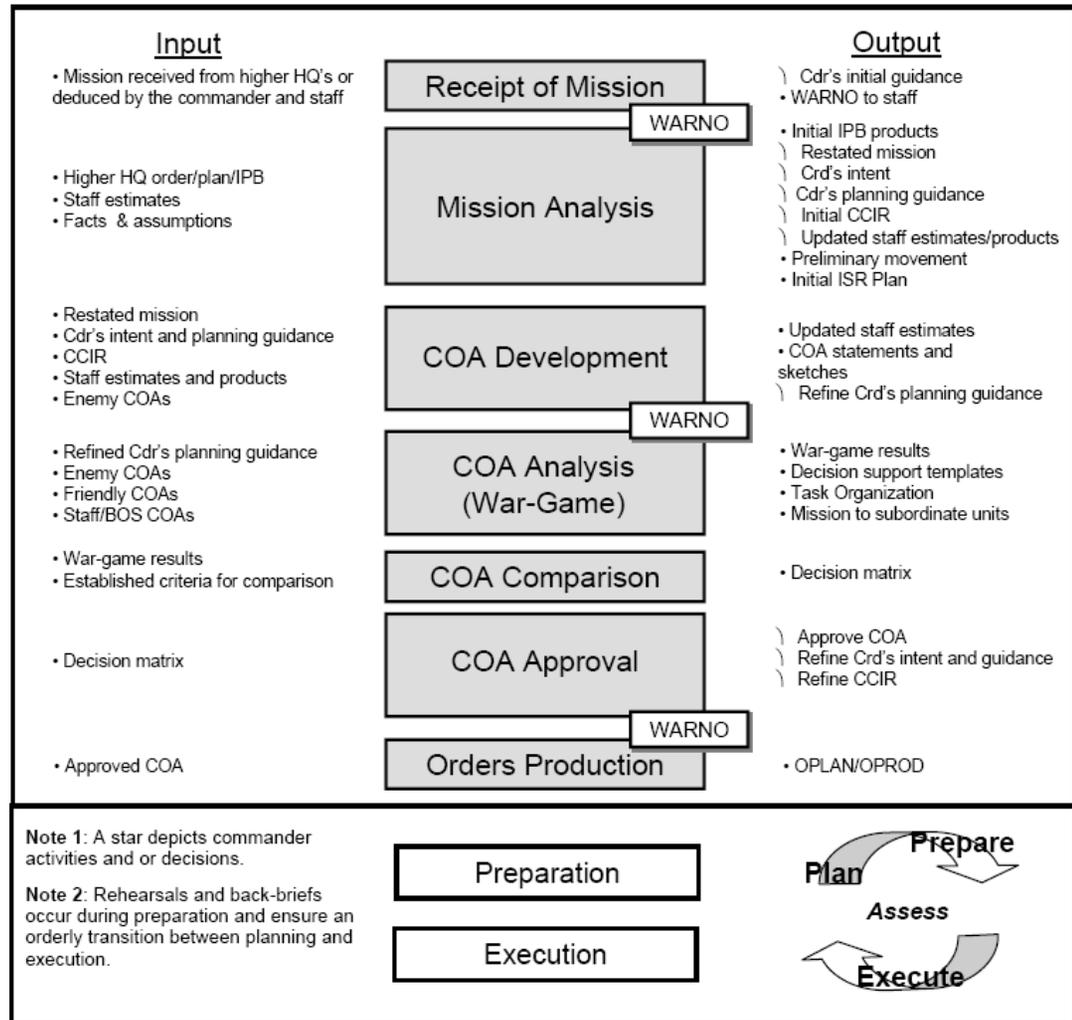
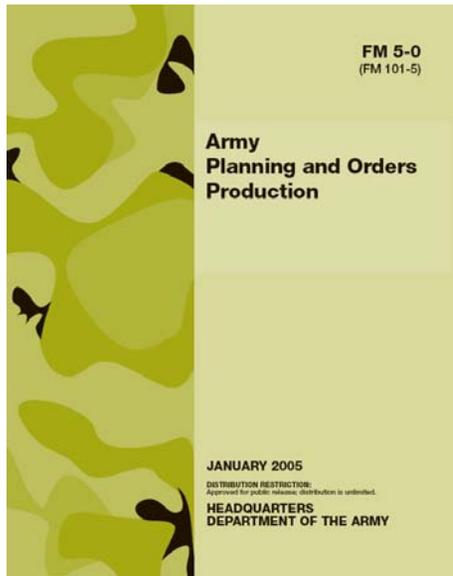
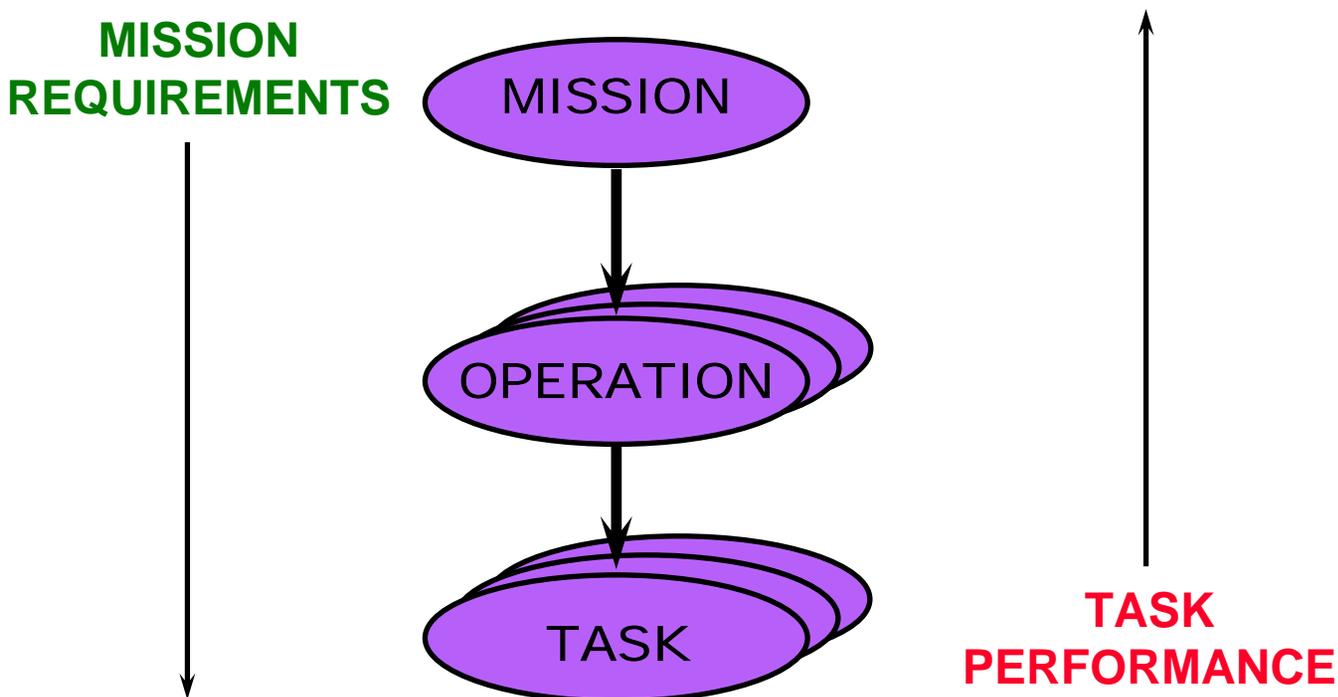


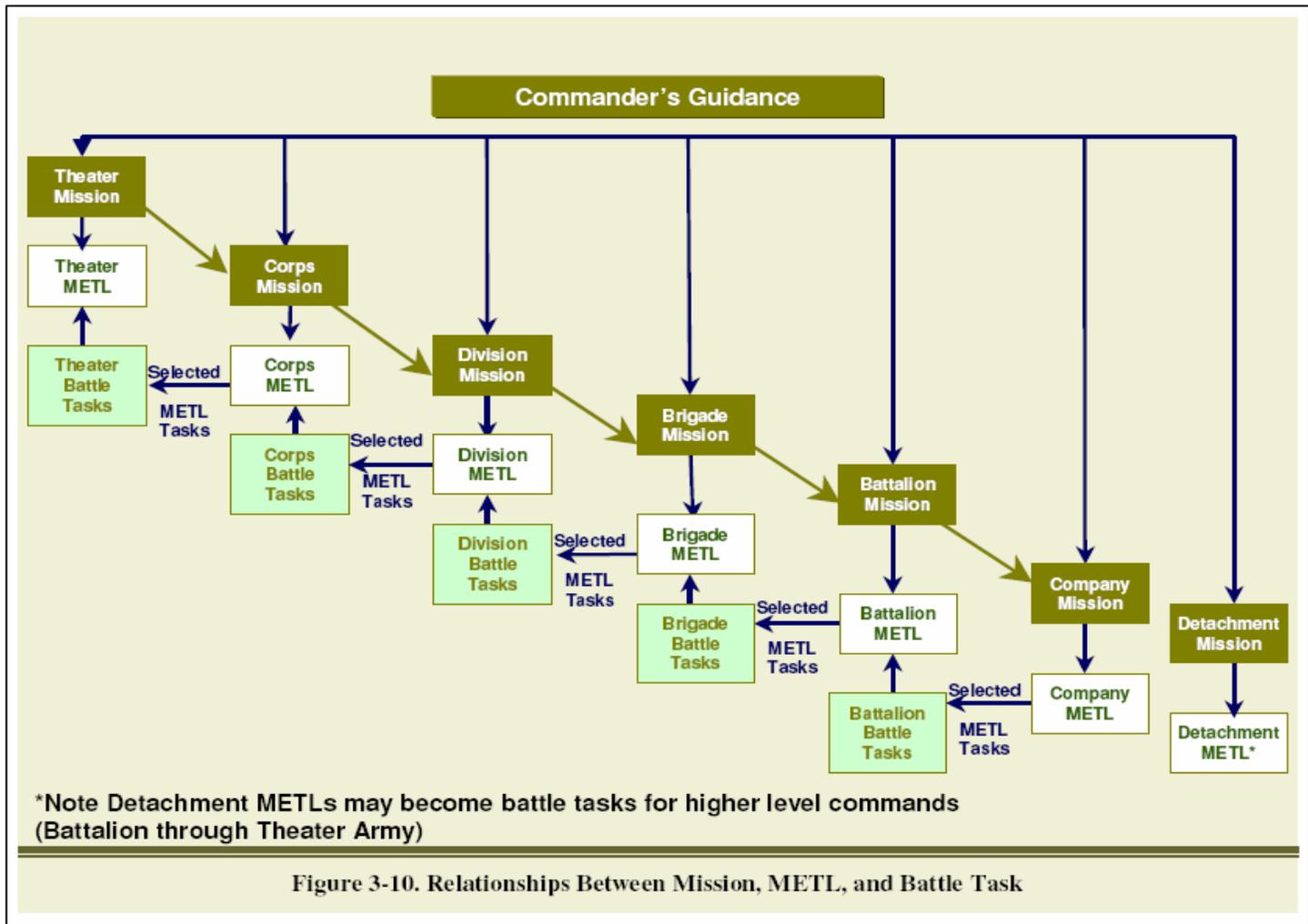
Figure 3-1. The Military Decision Making Process

Mission / Operation / Task



- ❖ **We measure Task Performance**
 - Task to Operation (Small to Big)
- ❖ **We measure Mission Accomplishment**
 - Are we getting the job done (MOEs)

Mission to Task Decomposition – Establishes Vertical Linkage...



... and Horizontal Linkage between subordinate units...

Corps Mission Essential Task: Conduct Shaping Operations Division Mission Essential Task: Conduct Deliberate Attack		
BATTLE TASK	UNIT TASK SELECTED	BATTLEFIELD OPERATING SYSTEMS
Conduct Deliberate Attack	1st and 2d Brigade	Maneuver
Conduct Deep Attack	Aviation Brigade	Maneuver
Provide Fire Support for Combat Operations	DIVARTY	Fire Support
Reduce Complex Obstacles for Division Deliberate Attack	Engineer Brigade	Mobility / Counter-mobility / Survivability
Provide and Manage DS Combat Service Support	DISCOM	Combat Service Support
Conduct Intelligence and Electronic Attack Operations	MI Battalion	Intelligence
IOM Tactical Communications Networks (C4I) for the Division	Signal Battalion	Command and Control
Coordinate Air Defense C3I and Directed Early Warning	Air Defense Artillery Battalion	Air Defense

Figure 3-9. Example List of Division MSC and Separate Battalion Battle Tasks that Support a Mission Essential Task

... and Horizontal Linkage between Staff Elements

Element/Section	Staff Mission Essential Task
S1	Provide Personnel Services Support
S2	Conduct Intelligence Preparation of the Battlefield
	Develop an R&S Plan
S3	Plan Operations using MDMP
	Prepare OPLAN/OPORD
	Develop Task Organization Annex and Ops Overlay
S4	Develop Logistics Estimate
S5	Coordinate Host Nation Support
S6	Establish Information Network
DECOORD	Coordinate Fire Support
ENGR	Conduct M/CM/S Operations
ADA LNO	Conduct ADA Planning and Coordination
AVN LNO	Conduct Army Aviation Planning and Coordination
USAF ALO	Conduct A2C2 Management and Control Activities

Figure 3-7. Example of Brigade Staff METL

Vertical/Horizontal Mission to Task Linkage – Joint Perspective

Sample JMET

JMET: Coordinate Theater-wide Information Operations (IO) (ST 5.5)
Organization: J-3

- Conditions
 - C 2.3.2.3 Flexibility of Warfare Style (Flexible)
 - C 2.4.4 Theater Intelligence Organizations (Mature)
- Standards
 - 90 percent of subordinate plans have integrated C2W efforts
 - 10 days to achieve information superiority
- **Supporting Tasks - Identify Theater Issues and Threats (ST 2.4.1.1)**
 - Conditions
 - C 2.3.2 Military Style (Predictable)
 - Standards
 - 10 hours or less to identify enemy COG
- **Command-linked Tasks - Support National and JTF Surveillance Reconnaissance Requirements (ST 2.2.2)**
 - Conditions
 - C 1.3.2 Visibility (High)
 - Standards
 - 90 percent of JOA has surveillance coverage

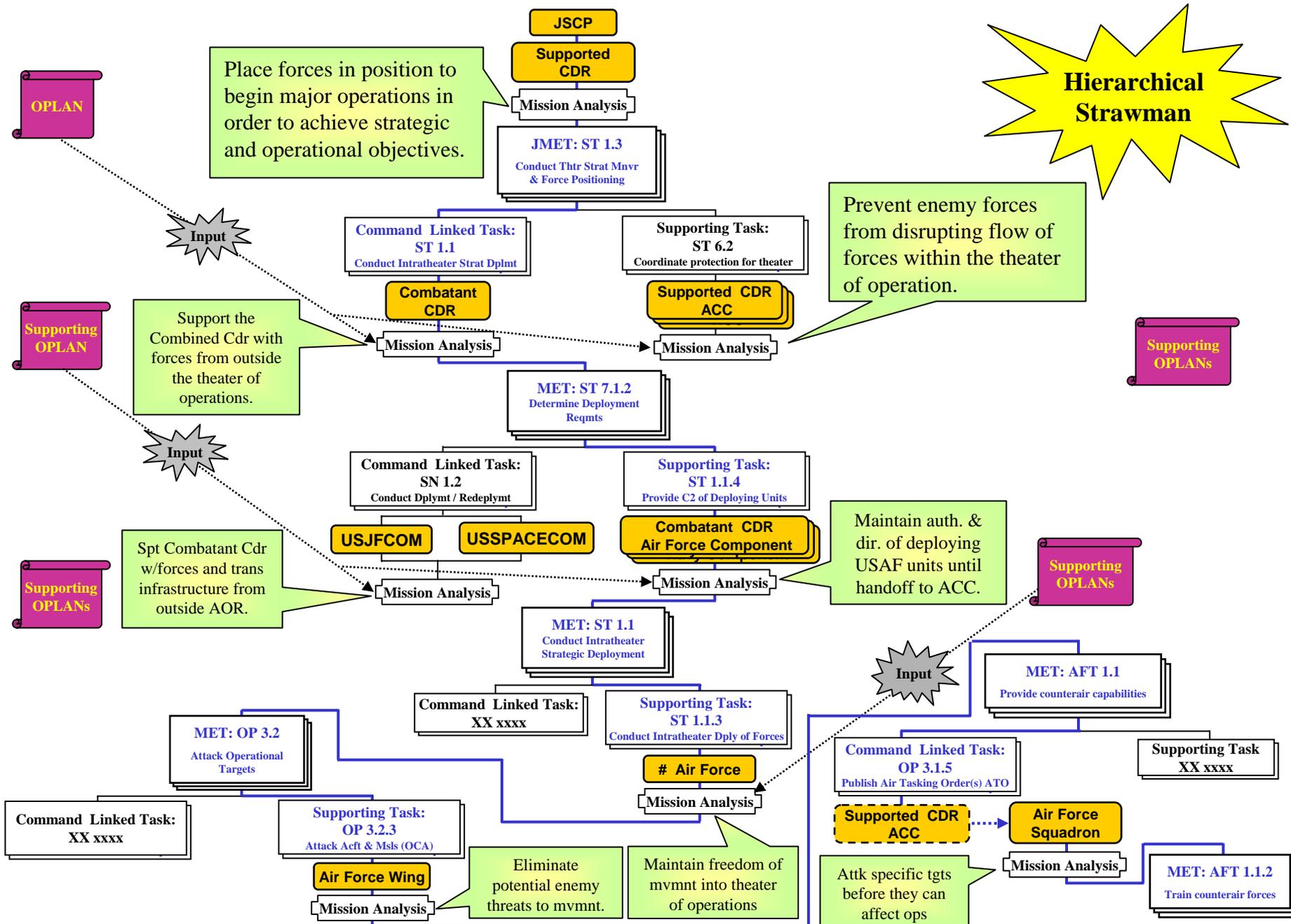
Vertical Linkage

Horizontal Linkage

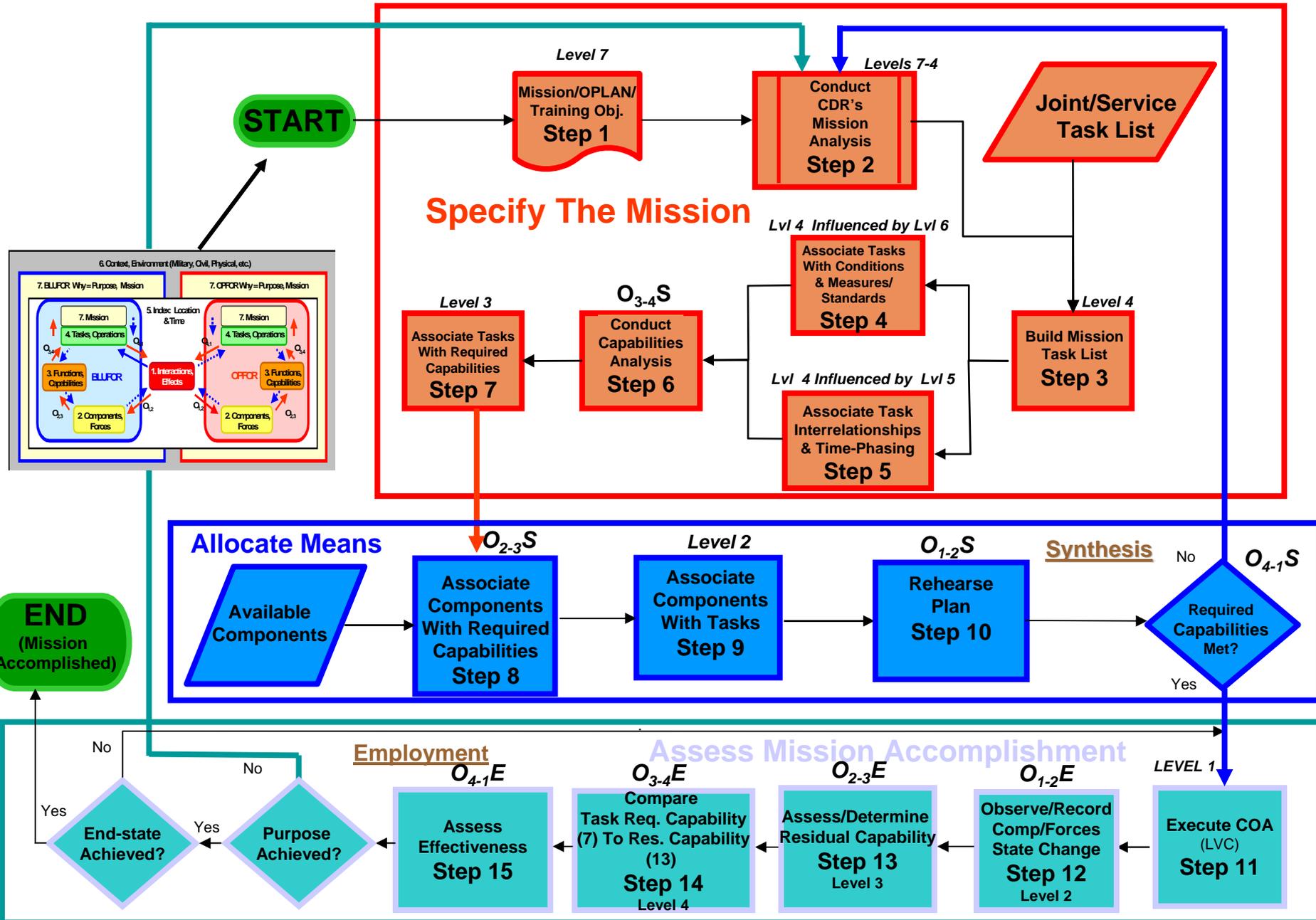
Sample METL – Army Brigade

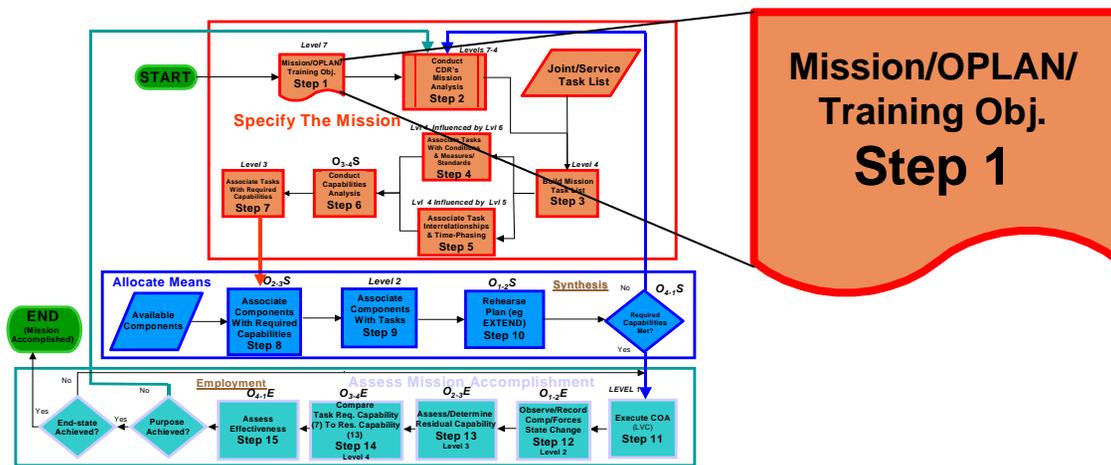
Alert and Deploy the Brigade <ul style="list-style-type: none">• Draw and upload basic/operational loads• Conduct soldier readiness / administrative / logistic preparation for overseas movement• Deploy advance parties or liaison officers• Move by road or rail to APOE or SPOE• Upload equipment at APOE or SPOE	
Conduct Attack <ul style="list-style-type: none">• Attack a Moving Enemy• Attack a Stationary Enemy• Movement to Contact	Conduct Defense <ul style="list-style-type: none">• Conduct a Mobile Defense• Conduct an Area Defense
Conduct Support Opns <ul style="list-style-type: none">• Domestic Support Operations• Foreign Humanitarian Assistance	Conduct Stability Opns <ul style="list-style-type: none">• Peacekeeping Operations• Combat Terrorism• Support Counter-Drug Operations
Conduct Sustainment Operations <ul style="list-style-type: none">• Provide medical treatment and evacuation (air and ground)• Move by air/surface transportation• Manage Terrain• Recover and evacuate disabled equipment• Control reconstitution of subordinate units• Conduct mortuary affairs operations	
<p>Figure 3-2. Example of Brigade Tasks Derived from Wartime Operational Plans and External Guidance</p>	

Putting it All Together – COCOM to Squadron Linkage example



MMF Formal Process Diagram





Mission/OPLAN/ Training Obj. Step 1

Need mission types and Scenario/vignettes from Requirements Documents and/or User Representative

- What Mission(s) is/are to be performed by the object under test?
 - Doctrinal mission type(s) (I.e. Stability Ops mission(s))
 - Doctrinal references to be used (Concepts, FM's, etc.)
- What Operating Environment is to be used to set the conditions for performance of the mission? What is the Road to War that established the Operational context for each each test vignette? What approved scenario has been selected to provide the appropriate environment and context?
 - Scenario/vignette documentation (MDMP products, maps or map references, COA statements and sketches, plans and orders, annexes, graphics, etc.).
 - Including selected OPLAN/OPORD products at least two levels up.

UA Vignette / Scenario Relationship



Scenarios

Caspian

Balkan

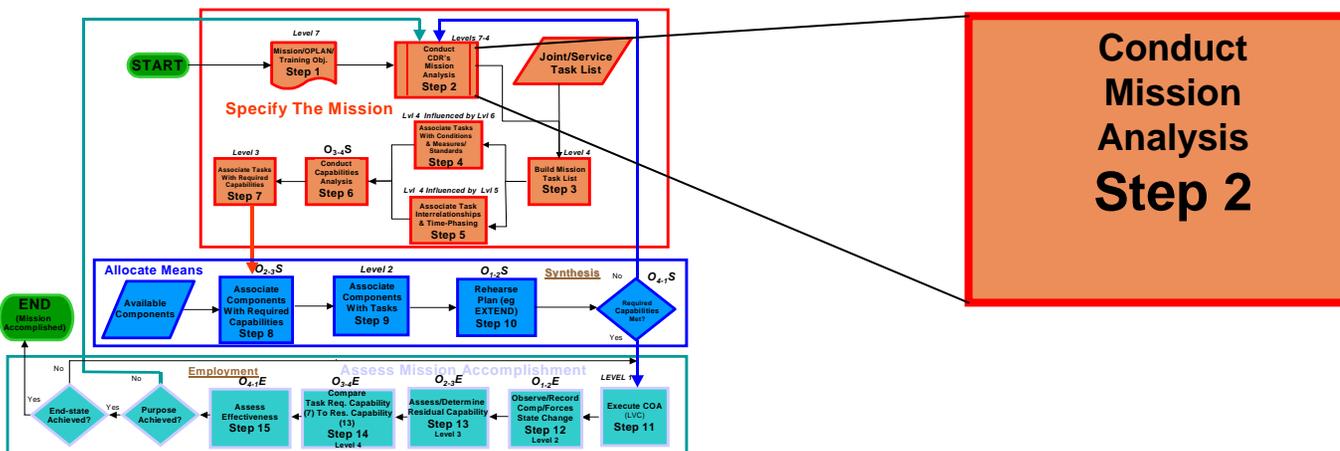
SW Asia

NE Asia

Vignettes

Bluefor Opfor Bluefor Opfor Bluefor Opfor Bluefor Opfor

<p>Product? OPORD, storyboards etc</p>							
<p>Vig #1 Entry Operations</p>							
<p>Vig #2 CA Ops in major urban areas</p>							
<p>Vig #3 Mounted Exploitation/Pursuit Ops</p>							
<p>Vig #4 Rapid Advance to enemy COG</p>							
<p>Vig #5 AASLT in mountain terrain</p>							
<p>Vig #6 Dismt Ops to conduct raid on decisive point in jungle</p>							



Conduct Mission Analysis Step 2

- Use the appropriate (**Joint/Service Specific**) doctrinal planning and decision making process to:
 - Analyze the assigned or perceived mission and determine/document the specified and implied tasks (with their associated purpose) required to accomplish the mission.
 - Determine and document facts, limitations, assumptions and constraints.
 - Describe Operating Environment and Impact on Operations
 - Describe Current Situation and Events leading up to it.
 - Describe Threat Situation, Mission, Intent, Vulnerabilities, etc.

MDMP

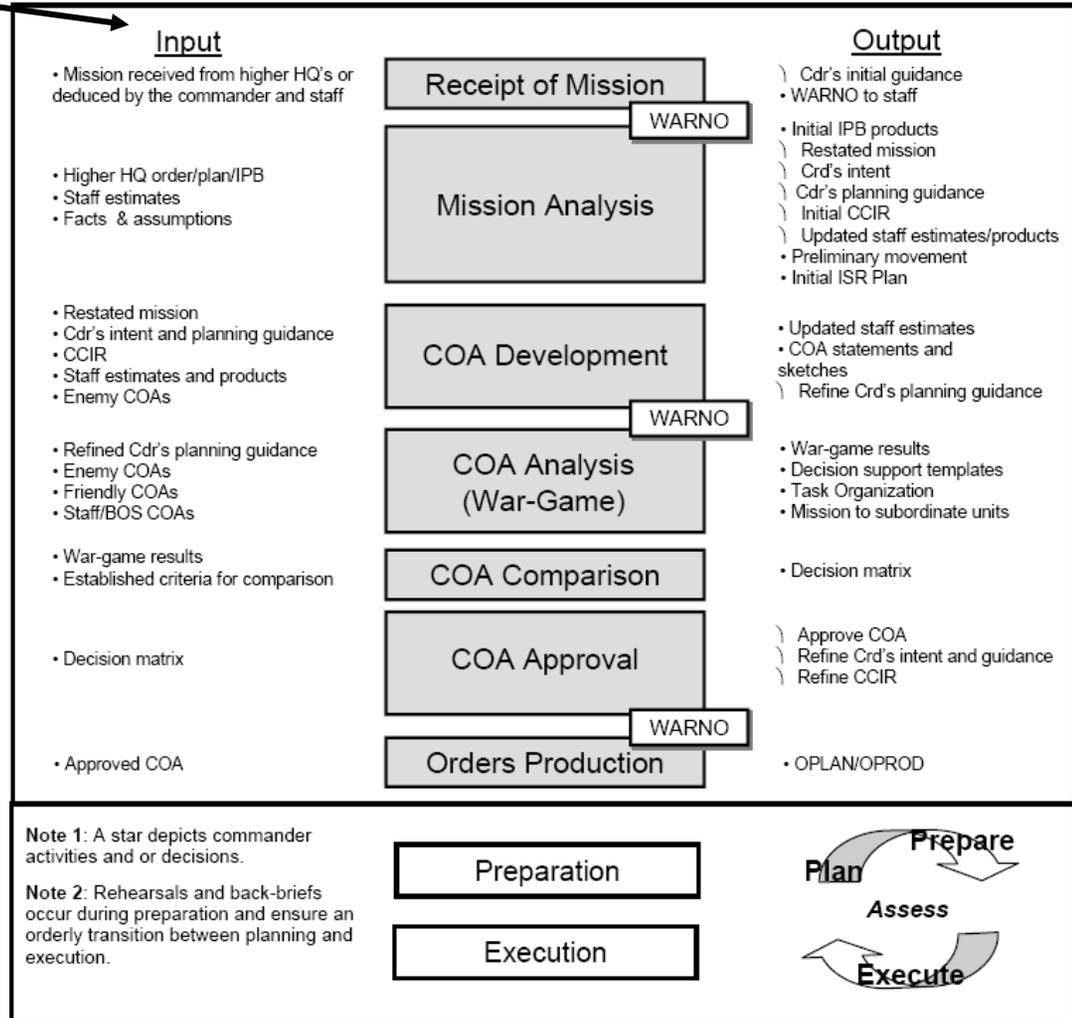
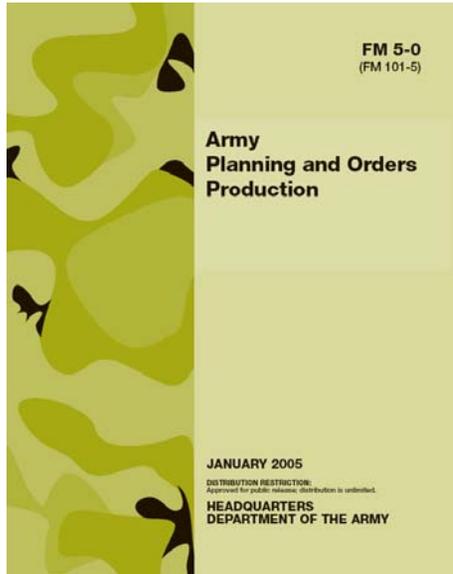
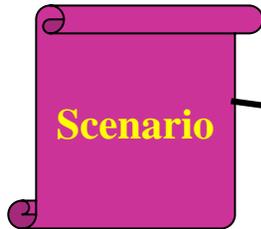


Figure 3-1. The Military Decision Making Process

Mission Analysis Process...

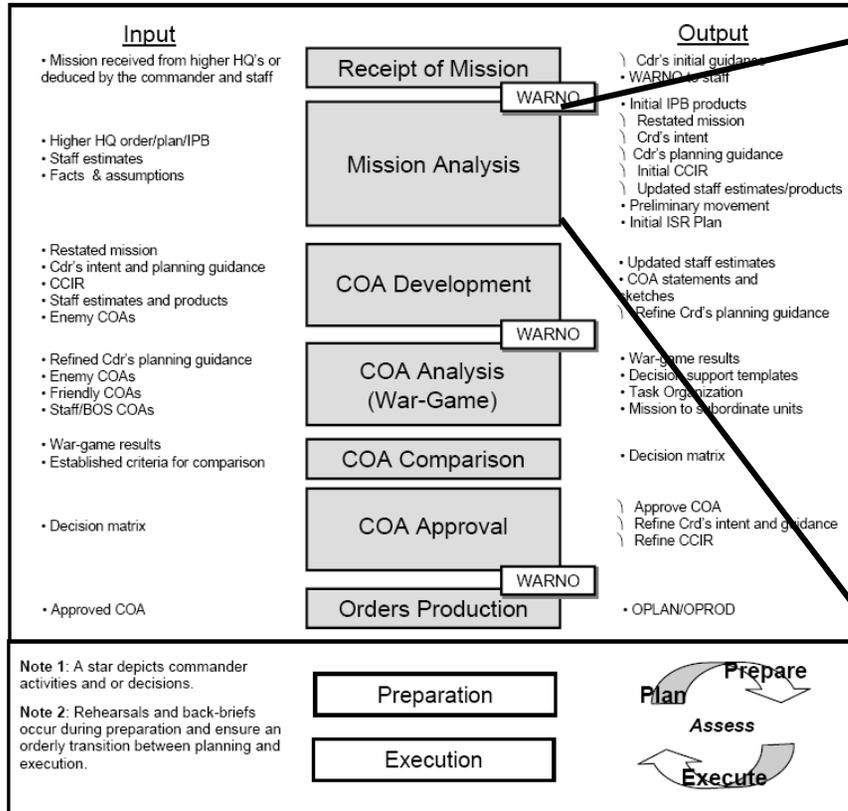


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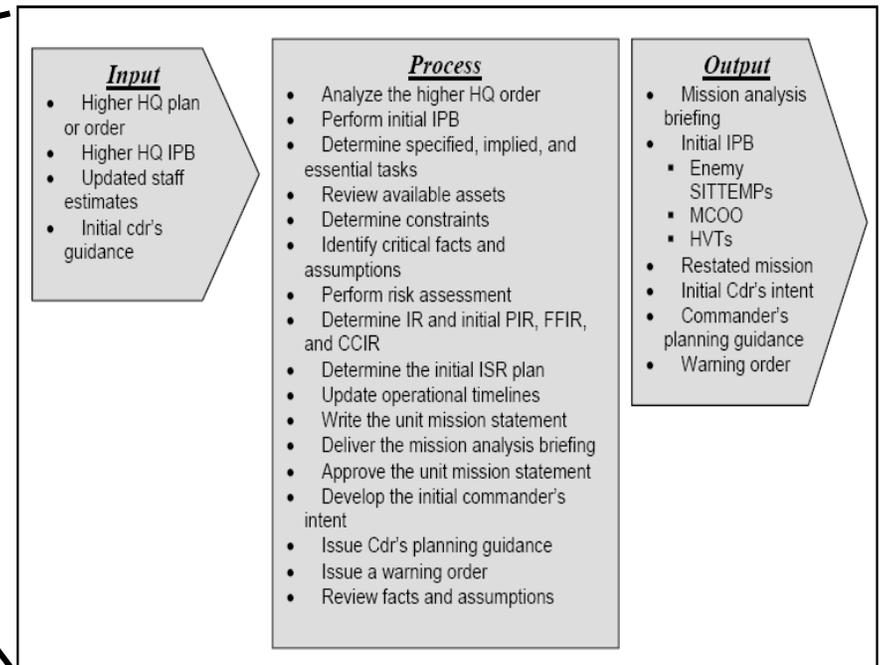


Figure 3-5. Mission Analysis

Yields MMF Level 7 – 5 data, list of Mission Tasks (big part of Level 4), and initial Force Listing (Level 2)

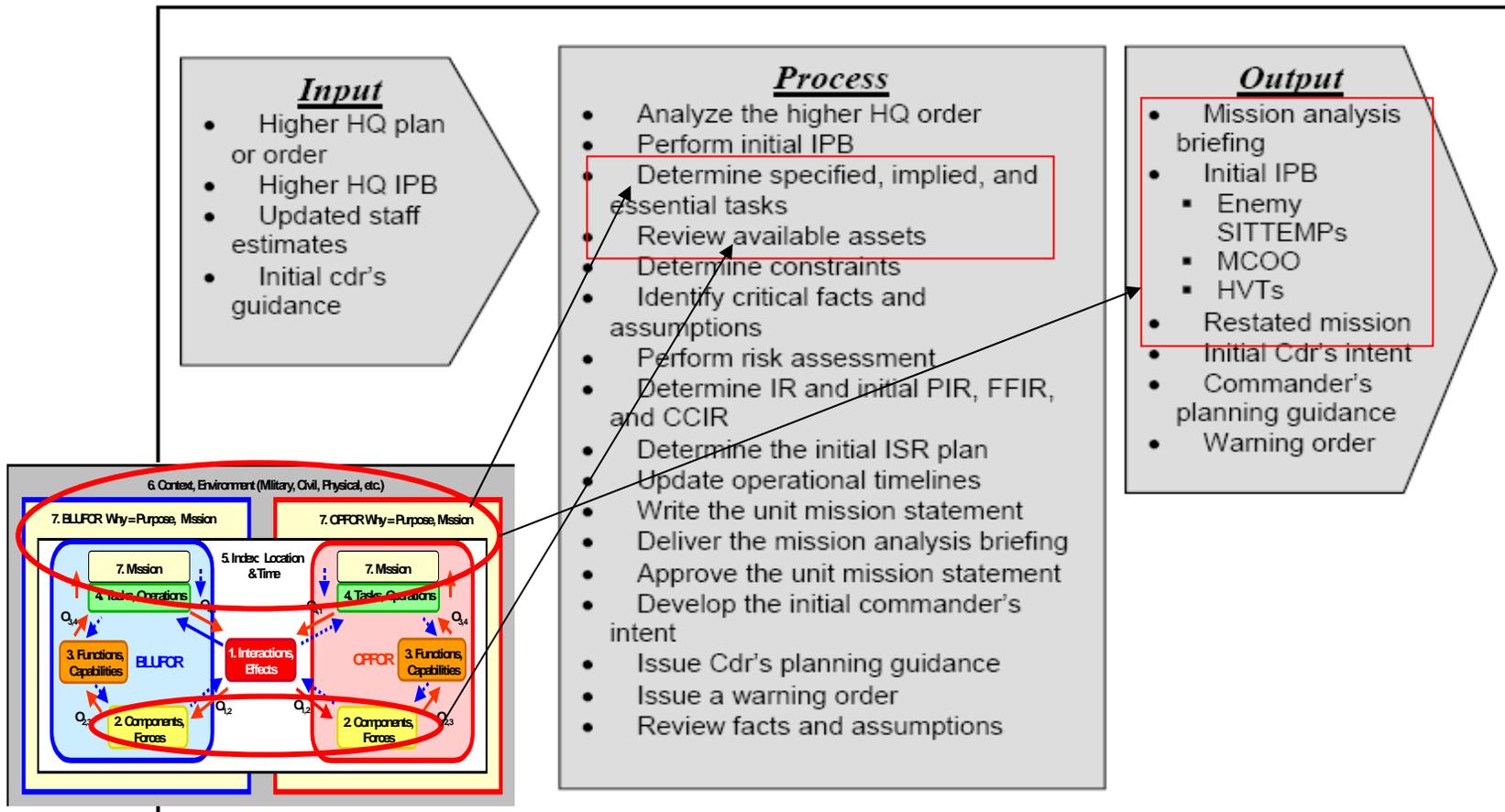


Figure 3-5. Mission Analysis

Conditions

- **Conditions are variables of the operational environment or situation that may affect performance.**
- Environment is the **immediate situation** or circumstance in which tasks must be performed.
- Conditions **impact the ability to perform** a task (e.g., security of lines of communication impact the ability to sustain joint task force operations).

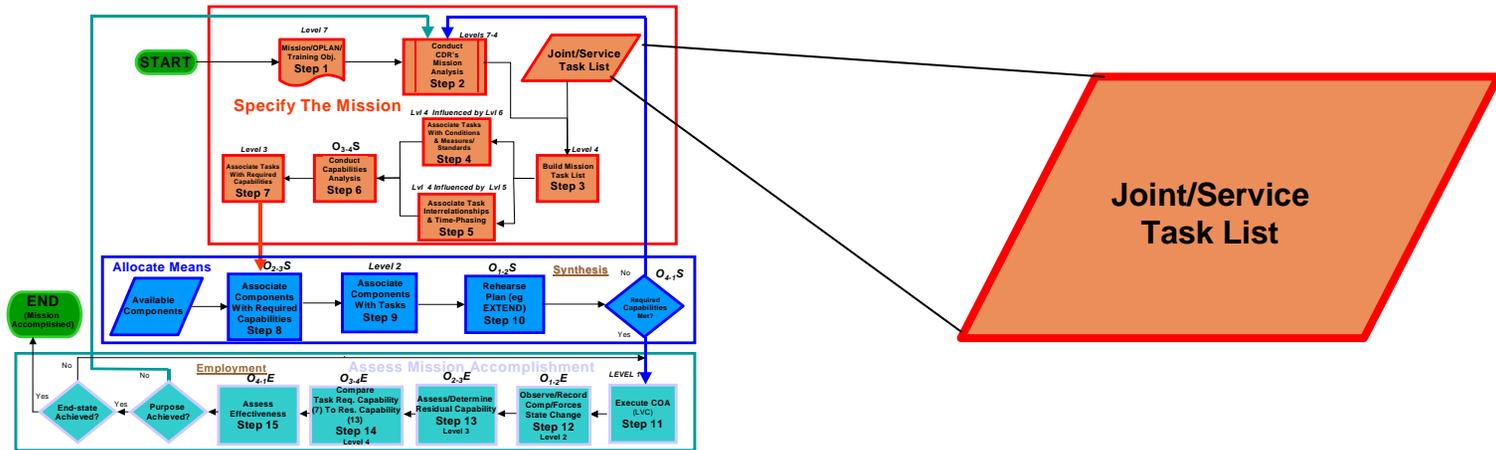
Conditions



(Friendly, Enemy)

- C 1.1 Land
- C 1.2 Sea
- C 1.3 Air
- C 1.4 Space

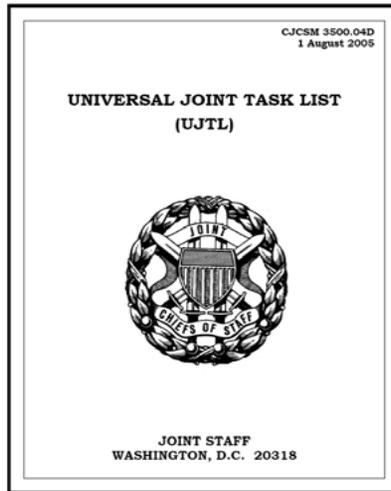
- C 2.1 Mission
- C 2.2 Forces
- C 2.3 Command, Control & Communications Related Conditions
- C 2.4 Intelligence Related Conditions
- C 2.5 Deployment, Movement, and Maneuver Related Conditions
- C 2.6 Firepower Related Conditions
- C 2.7 Protection Related Conditions
- C 2.8 Sustainment Related Conditions
- C 2.9 Threat Related Conditions



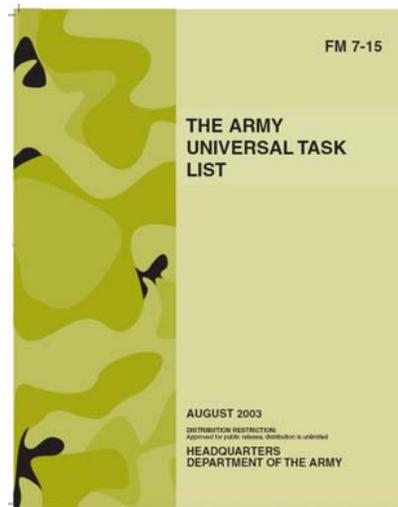
- Determine/select the source of tasks to be used to describe mission activities for the object under test.
 - Examples: UJTL, AUTL, UNTL, MCTL, IATL, FCS Single Integrated Task List (SITL), Soldier Training Plan (STP), Soldiers Manual of Common Tasks (SMCT), etc.
 - Ensure the selected task list is current and contained in the data base to be accessed by the task management tool (I.e. JTIMS, DTMS, ATIA, etc.)
- Determine/select an alternative source for acceptable substitute tasks in the event primary source does not have an adequate task description for a particular activity*

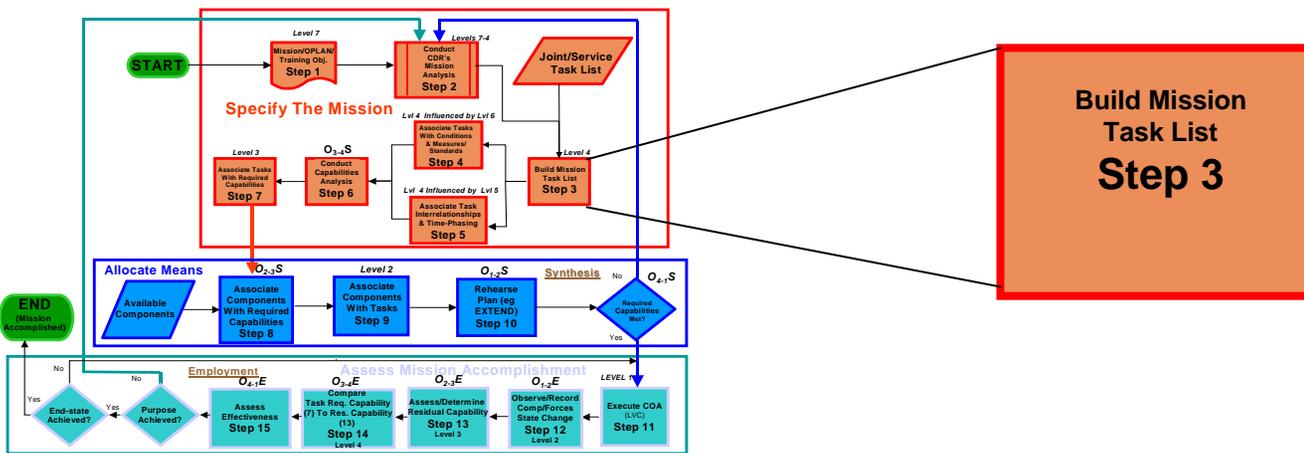
• *Tasks should come from authoritative (i.e. approved) source. Recommend you avoid using newly constructed and not yet approved tasks.*

Authoritative Task Lists



- Several authoritative sources available to describe elements of military operations
- Authoritative task lists are easily stored and maintained in data bases for access and manipulation





- Convert the mission (specified, implied) tasks from step 2 into tasks from the selected authoritative task list.
- Use doctrinal references for the types of missions and operations to be conducted to identify supporting tasks by functional area or Battlefield Operating System, or some similar organizing principle.
 - Approved doctrinal templates of tasks already exist for many doctrinal mission types and should be used as a starting point wherever possible. Potential sources include the UJTL, Navy NMETL's, and Army Mission Training Plans.
 - Templates will likely have to be modified to reflect specific aspects of the operational scenario.
- Capture, document and organize the resulting list of tasks into a data base mission file (see next slide)
 - This should be done in conjunction with Step 2, Mission Analysis or as closely thereafter as possible

Basis for Conversion to Authoritative Task Language

JMETL Development Guidance (CJCSM 3500.03A, 1 Sept 2002)

Perform Mission Analysis to determine specified and implied tasks.

Select appropriate UJTL tasks in JTIMS that are descriptive of specified and implied tasks. Result is list of Mission Tasks which are capabilities associated with each assigned mission

Determine which tasks are essential by applying commander-approved essentiality criteria for each mission to each mission task.

Assign responsible organizations, conditions and standards for that mission. Conditions are selected if they affect task performance. Standards relate to task performance under mission conditions.

Assign supporting and command linked tasks. Completed JMETS for all assigned missions with supporting and command linked tasks constitute a command's JMETL. Supporting tasks = Mission for subordinate organization

Sample Conversion of specified, implied tasks to authoritative task list tasks

Mission to task analysis results – Specified and implied tasks	Specified and implied tasks converted to tasks from authoritative task lists	Task Ref. Number
1 Establish the FOB	Establish Forward Operating Base	FCS 7-1-U4014
2 Select/Establish AORs	Establish and Conduct Command Post Operations to Support Tactical Operations	ART 7.1.1
3 Select FOB location	Establish Forward Operating Base	FCS 7-1-U4014
4 Gain and maintain situational understanding (e.g., the COP) of the battle space as it applies to JIM elements	Gain and maintain situational understanding (e.g., the COP) of the battle space as it applies to JIM elements which may affect the Unit	FCS17-6-S1003
17 C2 the UA/CAB (Conduct Battle Command)	C2 the UA/CAB (Conduct Battle Command)	FCS 71-6-U2052
24 Maintain Force Protection (Coordinate Force Protection Activities)	Coordinate Force Protection Activities	FCS71-6-U2520
25 Conduct Battalion Force Protection Activities	Conduct Battalion Force Protection Activities	FCS 71-1-S2520
26 Protect force from fires	Conduct Defense Maximizing Collaborative Networked Fires	FCS17-6-S2604
27 Establish Sensor Coverage Plan	Integrate Sensor Operations	FCS 71-6-U2155
28 Control Sensor Platoon Operations	Control Sensor Platoon Operations	FCS6-3-U6017
29 Perform Surveillance and Target Acquisition (Radar)	Perform Surveillance and Target Acquisition (Radar)	FCS6-4-U6045
30 Conduct Information Assurance	Conduct Information Assurance (IA)	FCS 71-5-U3124
31 Establish Responsibilities within the FOB	Task Organize For Operations	ART 7.5.3
32 Integrate Contract/Contractor Support Personnel Into UA Sustainment Operations	Integrate Contract/Contractor Support Personnel Into UA Sustainment Operations	FCS17-6-S1406
33 Secure FOB locations (Conduct Rear Area and Base Security Operations)	Conduct Rear Area and Base Security Operations	ART 5.3.5.4.1
34 Conduct Zone/Area Reconnaissance	Conduct Zone/Area Reconnaissance	FCS 7-2-S4404
35 Area Surveillance	Conduct Area Surveillance	FCS17-2-U4011
36 Assured Mobility (Coordinate Assured Mobility Operations)	Coordinate Assured Mobility Operations	FCS 71-6-U2525
37 Clear Obstacles	Clear Obstacles	ART 5.1.1.2
38 Conduct Route Clearance	Conduct Route Clearance	ART 5.1.1.2.2
39 Area Access (Conduct Area Clearance)	Conduct Area Clearance	ART 5.1.1.2.1
40 Occupy a Tactical Assembly Area	Occupy a Tactical Assembly Area	FCS 7-1-S4200
41 Non lethal response to security threats (Engage and Control Civilian Populations)	Engage and Control Civilian Populations	FCS 7-2-S4205
42 Secure civilian population (Secure Civilians during Operations (SOSO))	Secure Civilians During Operations (SOSO)	FCS 20-3-S6214
43 Control Networked Fires	Control Networked Fires	FCS 71-6-U2360
44 Coordinate Early Warning	Coordinate Early Warning	FCS 71-6-U2366
45 Defend the FOB	Conduct Area Security Operations.	FCS7-2-S4010
46 Entry/Exit Control	No Match	NA
47 Plan ECPs and Provide Resources	No Match	NA
48 Establish the ECP	Control Checkpoint(s) (SOSO)	FCS 20-2-C6203
49 Operate an ECP	Operate Checkpoint (SOSO)	FCS20-3-S6207
50 Prepare Protective Positions	Prepare Protective Positions	ART 5.3.1.3
51 Employ Protective Obstacles	Employ Protective Obstacle(s)	FCS 7-3-U4025
52 Construct Protective Earth Wall, Berms and Revetments	Construct Protective Earth Walls, Berms, and Revetments	ART 5.3.1.3.1
53 Construct Vehicle, Information System, Equipment, and Material Protective Positions	Construct Vehicle, information System, Equipment, and Material Protective Position	ART 5.3.1.3.2

Operational Template from UJTL, CJCSM 3500.04D, dtd. 1 August 2005

AIR ASSAULT

Description:

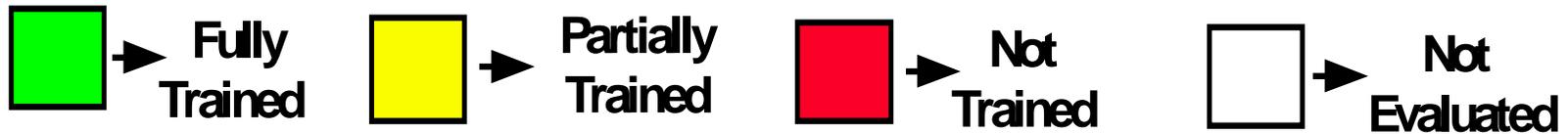
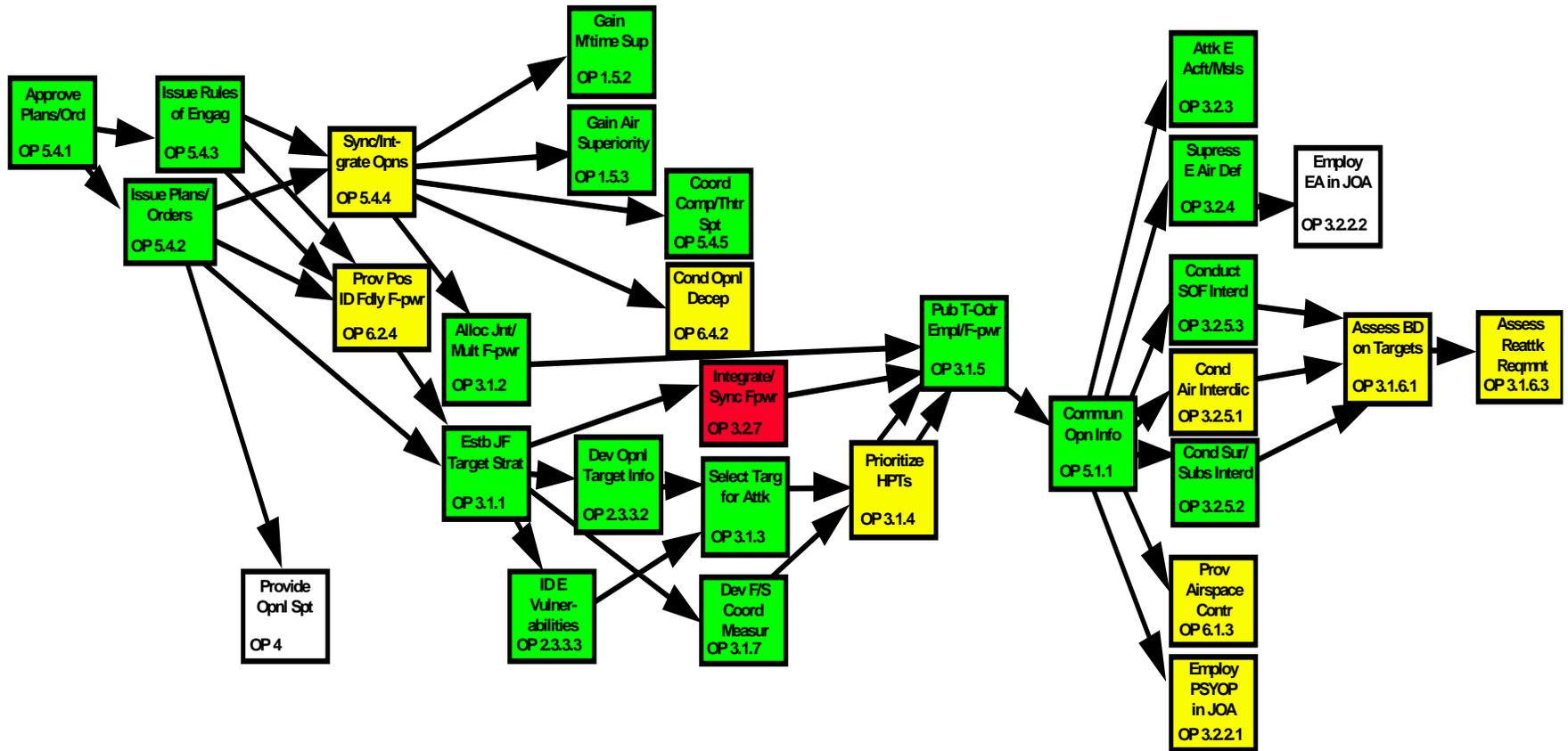
A forcible entry operation conducted by the US Army's air assault units to seize a lodgment (normally an airfield) and defend it while the JFC executes a rapid build-up of combat power.

Search Documents: CJCSM 3500.04B, CJCSM 3500.02B, JP 1-02, CJCSM 3500.04A, CJCSM 3500.05

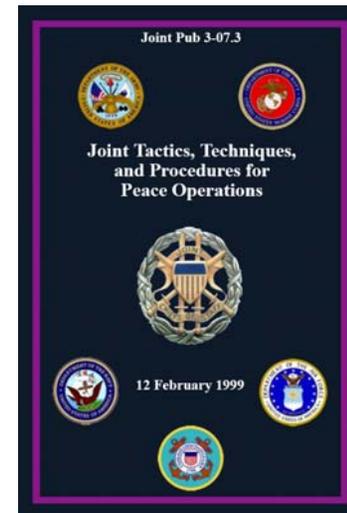
Tasks:

TASK	DESCRIPTION
ST 1.3.3	Synchronize Forcible Entry in Theater
ST 1.3.4	Integrate Direct Action in Theater
ST 5.4.2	Synchronize Joint Operations and Subordinate Campaign Plans
ST 6.2.1	Coordinate the Preparation of Strategically Significant Defenses
ST 7.1.3	Tailor Joint Forces for Deployment
OP 1.2.4.3	Conduct Forcible Entry: Airborne, Amphibious, and Air Assault
OP 1.2.4.4	Reinforce and Expand Lodgment
OP 1.2.5	Conduct Offensive Operations in the Joint Operations Area
OP 1.2.6	Conduct Defensive Operations in the Joint Operations Area
OP 1.3.1	Overcome Operationally Significant Barriers, Obstacles, and Mines
OP 1.5.1	Control of Operationally Significant Land Area in the Joint Operations Area
OP 2.4.1	Evaluate, Integrate, Analyze, and Interpret Operational Information
OP 3.1.7	Employ Fire Support Coordination Measures
OP 3.2.7	Synchronize Operational Firepower
OP 5.3.1	Conduct Operational Mission Analysis
OP 5.3.3	Determine Operational End State
OP 5.4.4	Synchronize and Integrate Operations
OP 5.5.1	Develop a Joint Force Command and Control Structure
OP 6.1.4	Counter Enemy Air Attack (Defensive Counterair (DCA)) in the Joint Operations Area
OP 6.5.5	Integrate Host-Nation Security Forces and Means

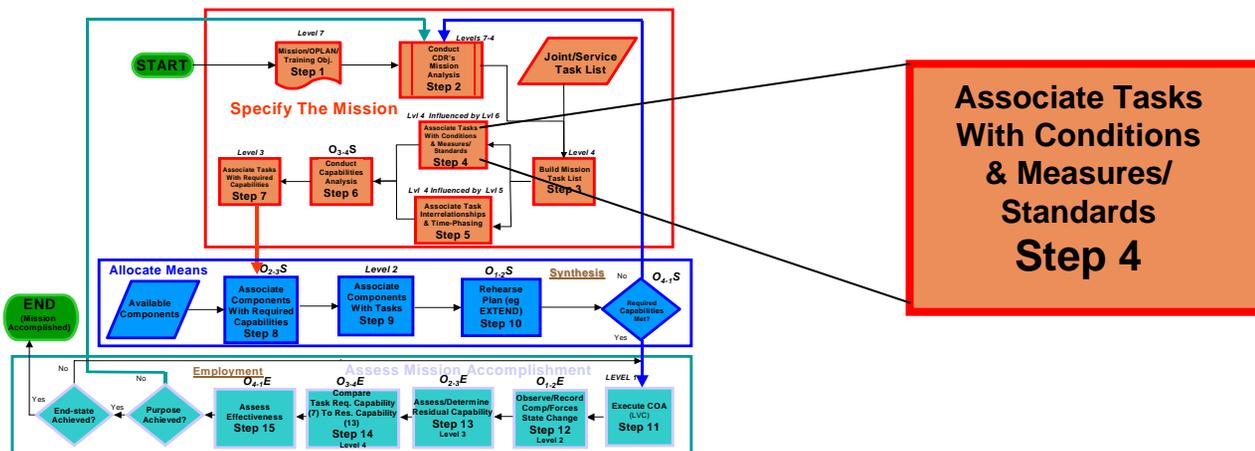
Systems Approach Using JTS



Doctrinal Sources



- Online Joint and Service digital libraries provide a ready reference to doctrine and TTPs for identifying supporting tasks



- Develop, select and wargame a Course of Action COA to accomplish the mission
 - Conducted using:
 - Maps of the Scenario area of operations
 - COA development and wargaming steps from Military Decision Making Process (MDMP)
 - Laptop computer with In-Focus projector to project COA sketch for reference in conference room/work area
 - MS Project application software*
 - Prior to wargaming, one DRC SME set up the Mission file for the base COA in MS Project by:
 - Setting initial parameters in terms of duration of the vignette and time increments to be used.
 - Importing tasks from the step 3 mission task report generated by JTIMS into the tasks portion of the Mission file

Develop a COA

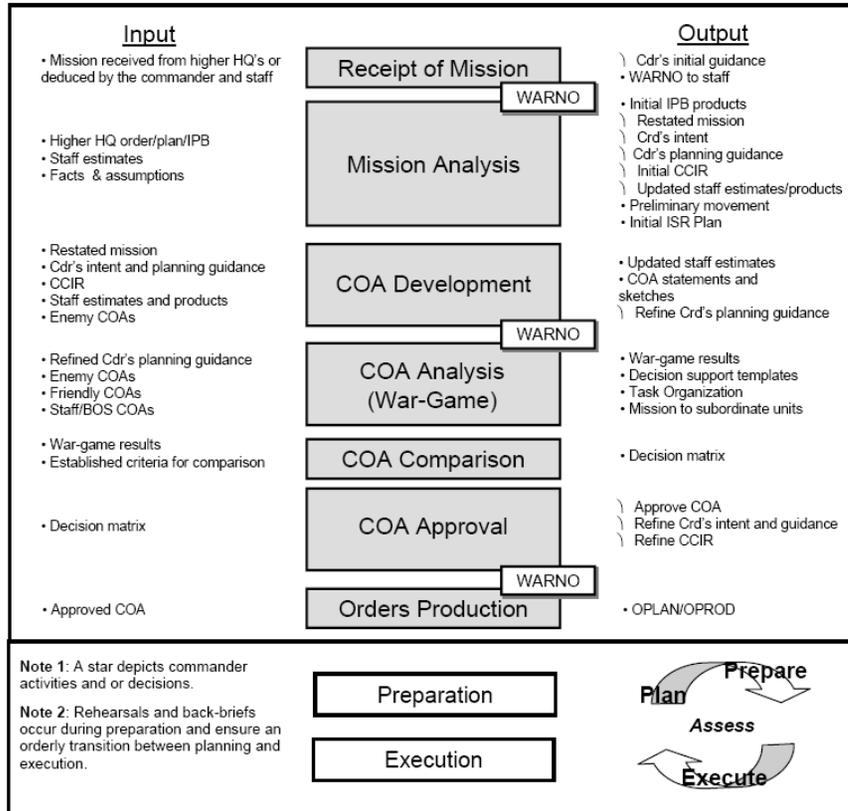


Figure 3-1. The Military Decision Making Process

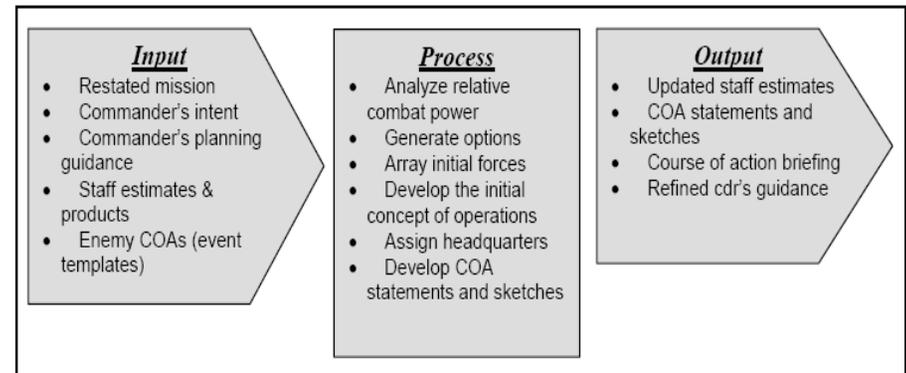
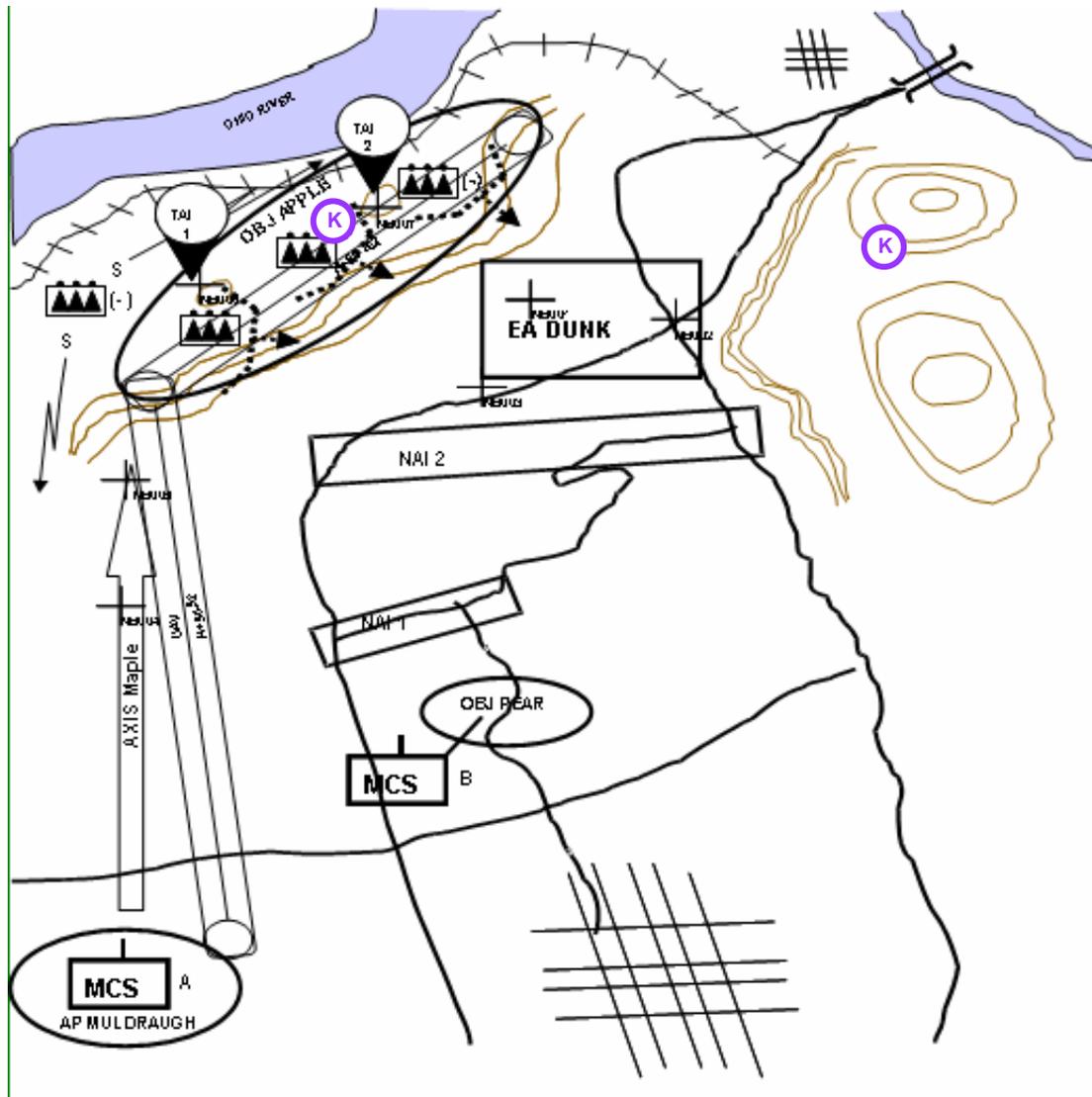


Figure 3-8. COA Development

Will Convert COA into Mission Thread Structure...

Sample COA Sketch and Statement



MISSION:

Attack north on AXIS Maple and seize OBJ APPLE NLT 0600 hrs. Establish attack by fire positions on OBJ APPLE and engage enemy forces already in or entering EA DUNK IOT block enemy forces from moving north to support rebel leadership vic Westpoint or support enemy forces defending in and around Louisville.

ENDSTATE:

Enemy forces vicinity of Knox remain south of EA DUNK until friendly operations vicinity of Westpoint are completed.

-  - Targeted Area of Interest
-  - Key Terrain
-  - MCS Engagement Area
-  - Named Area of Interest

Fully Developed COA Statement

MISSION: At 170400Z March 03, 52d ID (Mech) attacks to defeat elements of the 12th DTG in AO LION to protect the northern flank of the 55th AD, the 21st (US) Corps main effort.

INTENT: The purpose of this attack is to prevent repositioning of 12th DTG forces to the south and interfering with 21st (US) Corps decisive operation (the 55th AD's seizure of OBJ STRIKE). Key tasks are:

- ◆ Destroy 73d Brigade Tactical Group (BTG) south of the METRO CITY-CENTRAL TOWN-RIVER TOWN Line to prevent their repositioning south into 55th AD's AO.
- ◆ Seize OBJ SLAM by 181800Z MAR 03 to secure the northern flank of the 55th AD.
- ◆ Defeat the 12th DTG's reserve (23d BTG) vicinity EAST TOWN to prevent them from interfering with the seizure of OBJ SLAM.

At end state, the corps' right flank is secure with two brigades consolidated in defense positions vicinity OBJ SLAM. The division is prepared to conduct follow-on offensive operations to defeat enemy to PL RED.

DECISIVE OPERATION: Armor Bde #1 passes through the southern Mech Bde #1 east of PL AMBER and attacks to seize the key terrain vicinity of OBJ SLAM in order to protect 55th AD's northern flank.

SHAPING OPERATIONS: Mech Bde #1 in the south, the initial main effort, conducts a penetration to destroy enemy force vicinity PL AMBER to create enough maneuver space for Armor Bde #1 to pass to the East without interference from the 73d BTG in order to seize key terrain vicinity of OBJ SLAM and protect the northern flank of the 55th AD. Armor Bde #1 becomes the main effort after conducting forward passage of lines with Mech Bde #1 and then accepts battle-handover along PL GREEN. Mechanized Bde #1 then follows and supports Armor Bde #1 and the division reserve by attacking east to clear remaining elements of the 73d from PL Amber to PL Green in order to protect the rear of both units.

The division reserve, an armor-heavy task force, initially follows Mechanized Bde #1 with the following priorities of commitment: 1). Contain enemy forces capable of threatening Armor Bde #1's passage through Mechanized Bde #1 allowing battle-handover to occur along PL Green. 2). If not committed west of PL Green, follows Armor Bde #1 and blocks enemy force capable of threatening this brigades movement east enabling it to seize the key terrain vicinity of OBJ SLAM and protect the north flank of the 55th AD.

In the north, Mech Bde #2 attacks east to fix the 72d BTG denying it the ability to interfere with the division's decisive operations in the south. The division cavalry squadron conducts a moving flank screen along the division's northern boundary to provide early warning of enemy forces attacking south into the northern flank of Mech Bde #2.

COA #1 (continued)

Once Mech Bde #1 crosses PL AMBER (LD), the division attack helicopter battalion (AHB) attacks along AIR AXIS SIDNEY to destroy the enemy tank battalion vicinity WEST TOWN to protect then northern flank of Mech Bde #1 and allowing it to pass Armor Bde #1 east. Once Armor Bde #1 accepts battle-handover along PL GREEN, the AHB attacks along AIR AXIS GIZMO to defeat the 23d BTG south and east of the NORTHERN MOUNTAINS to allow Armor Bde. #1 to seize the key terrain vicinity of OBJ SLAM and protect the northern flank of the 55th AD.

Division fires will: 1). Conduct SEAD along AIR AXES SIDNEY and GIZMO to allow the AHB to destroy the enemy tank battalion vicinity WEST TOWN and to defeat the 23d BTG south and east of the NORTHERN MOUNTAINS, respectively; 2). Conduct counter fire to neutralize two battalions of the 12th DTG's Integrated Fires Command (IFC) to prevent it from massing fires against the southern two brigades; 3). Provide suppressive fires against 73d BTG defenses along PL AMBER to enable Mech #1's penetration.

Division ISR operations focus on: 1). Identifying the location and disposition of the 73d BTG battle zone to determine optimal point of penetration for MECH Bde #1 along PL AMBER; 2). Location and disposition of the 12th DTG's IFC assets to assist counter fire efforts; 3). Location and intentions of the enemy tank battalion and ADA assets vicinity WEST TOWN, and location and intention of the 23d BTG, the enemy's reserve, vicinity the NORTHERN MOUNTAINS, to assist the AHB attacks.

SUSTAINING OPERATION. The division support area will establish vicinity METRO CITY with MSR's SEAN and NICK as the primary routes used to sustain combat power during the attack. A mechanized company team is the division TCF with priority of responding to any LEVEL III treats to division class III supply point.

The deception objective is: commander of the 12th DTG commits his reserve, the 23d BTG, at H+10 to block penetration of US forces in the north of AO LION in order to protect the 24th DTG, the 1st Field Group's main effort. The deception story is that the division's decisive operation is in the north, with the following indicators: the initial positioning of an armor-heavy brigade in the northern portion of the rear are in AA MIKE, simultaneous attacks of two brigades abreast in the north and south, the division cavalry squadron operating on the north flank of the division AO, and early commitment of the division's AHB destroy an enemy tank battalion in the north.

Tactical risk is assumed by early commitment of the division's AHB, potentially leaving it without sufficient combat power to defeat the 23d BTG, the enemy's reserve.

Figure 3-12. Course of Action Statement (COA #1)

Wargame a COA

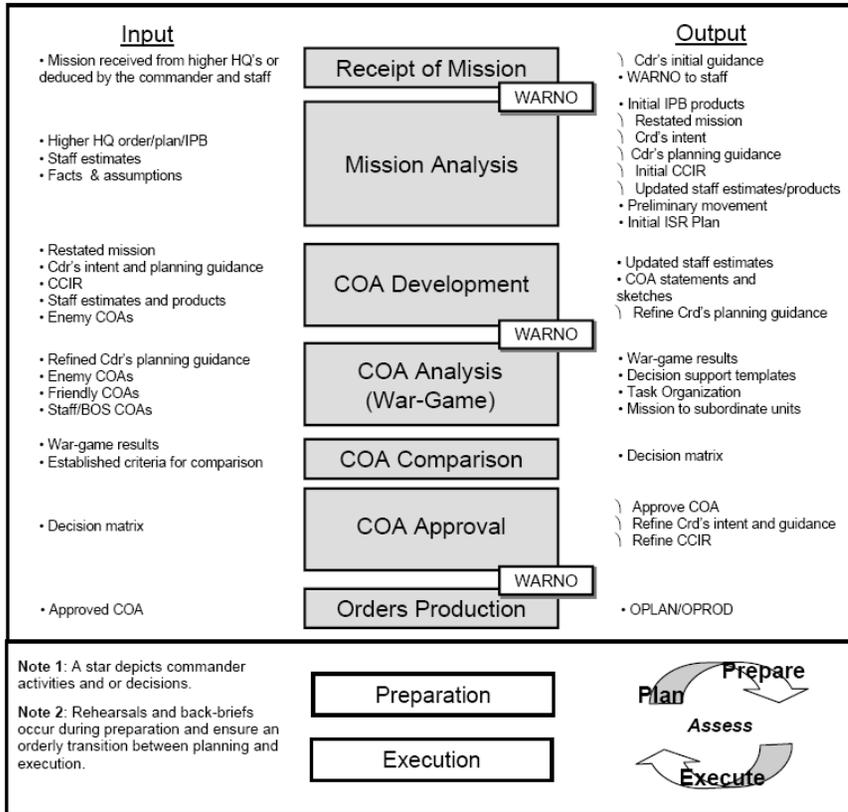


Figure 3-1. The Military Decision Making Process

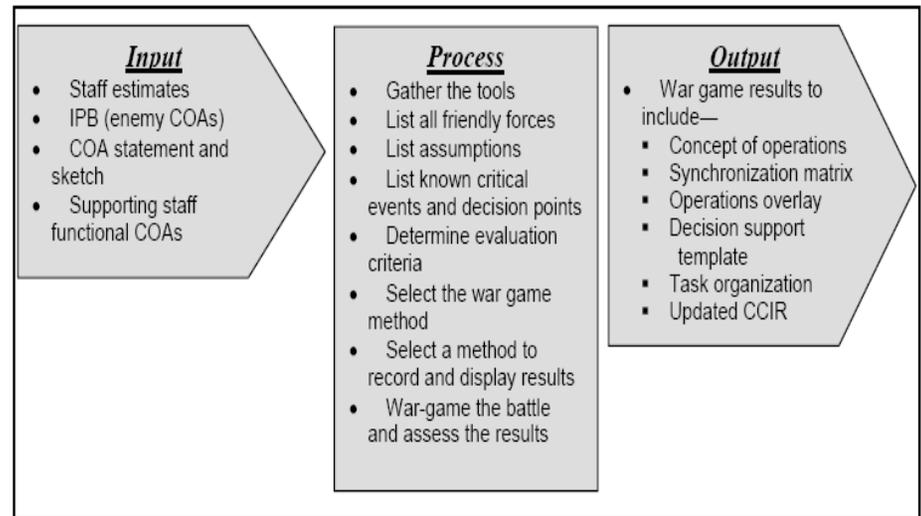


Figure 3-12. Course of Action Analysis (War Game)

**Associate Tasks
With Conditions
& Measures/
Standards
Step 4**

Continued

Generates details needed to populate Mission Tasks in order to perform meaningful evaluation

- During the wargaming process, record the results of the wargaming by:
 - Ordering mission tasks in the wargamed sequence
 - Annotating the task purpose, conditions, Measures of Effectiveness (MOE), and Measures of Performance (MOP) for each task to be observed and evaluated, based on wargaming team discussion and consensus.
 - Upon completion of initial wargaming process, review, critique and modify above results as required. Focus should be on the following questions:
 - Did we select the most appropriate task to describe the activity?
 - Is the purpose of the task clearly stated and does it make good tactical sense?
 - Do the MOEs support ability to determine if the purpose is achieved?
 - Do the MOPs support and flow logically from the MOEs and are they objectively measureable?

Wargaming generates detailed and valuable information – Who knew?

3-187. An effective wargame results in the commander and staff—

- Refining or modifying each COA, including identifying branches and sequels that become on-order or be-prepared missions.
- Refining the locations and times of decisive points.
- Identifying key or decisive terrain and determining how to use it.
- Refining the enemy event template and matrix.

FM 5-0

- Refining the task organization, including forces retained in general support.
- Identifying tasks the unit retains and tasks assigned to subordinates.
- Allocating assets to subordinate commanders to accomplish their missions.
- Developing decision points.
- Developing a synchronization matrix.
- Developing decision support template.
- Estimating the duration of the entire operation and each critical event.
- Projecting the percentage of enemy forces defeated in each critical event, and overall.
- Identifying likely times and areas for enemy use of WMD and friendly NBC defense requirements.
- Identifying the potential times or locations for committing the reserve.
- Identifying the most dangerous enemy COA.
- Identifying locations for the commander, command posts, and INFOSYS nodes.
- Identifying critical events.
- Identifying requirements for BOS support.
- Determining requirements for military deception and surprise.
- Refining C2 requirements, including control measures and updated operational graphics.
- Refining CCIR and IR—including the LTIOV—and incorporating them into the ISR plan and Information Management plans.
- Developing the ISR plan and graphics.
- Developing IO objectives and tasks (see FM 3-13).
- Developing fire support, engineer, air defense, IO, and CSS plans and graphic control measures.
- Identifying the effects of friendly and enemy action on the civilian population and infrastructure, and how these will affect military operations.
- Identifying or confirming the locations of NAIs, TAIs, decision points, and IR needed to support them.
- Determining the timing for concentrating forces and starting the attack or counterattack.
- Determining movement times and tables for critical assets, including INFOSYS nodes.
- Identifying, analyzing, and evaluating strengths and weaknesses of each COA.
- Integrating targeting into the operation, to include identifying or confirming high-payoff targets and establishing attack guidance.
- Identifying hazards, assessing their risk, developing controls for them, and determining residual risk.

Wargaming Notes

CRITICAL EVENT: Aviation Deep Attack	
Sequence #	
Action	AVN BDE attacks to destroy enemy reserve on OBJ DEBRA
Reaction	Anti-air ambush in route
Counteraction	J/SEAD change air axis
Assets	1-78 FA (MLRS), 1-222 (AHB), Fixed-Wing
Time	H-2 to H + 1
Decision Point	DP 3b and 3c
CCIR	Location of enemy armor reserve south of PL Kansas
Control	Air Axis Falcon and Eagle
Remarks	
Figure 3-17. Sketch Note Work Sheet	

Task and Purpose

<u>Actions by Friendly Forces</u>	<u>Effects on Enemy Forces</u>
<ul style="list-style-type: none">▪ Attack-by-Fire▪ Breach▪ Bypass▪ Clear▪ Consolidate and Reorganize▪ Control▪ Disengage▪ Follow and Assume▪ Follow and Support▪ Linkup▪ Occupy▪ Reduce▪ Retain▪ Secure▪ Seize▪ Support by Fire	<ul style="list-style-type: none">▪ Block▪ Canalize▪ Contain▪ Defeat▪ Destroy▪ Disrupt▪ Fix▪ Interdict▪ Isolate▪ Neutralize▪ Penetrate▪ Turn

Figure 3-7. Mission Tasks

Conditions

- **Conditions are variables of the operational environment or situation that may affect performance.**
- **Environment is the immediate situation or circumstance in which tasks must be performed.**
- **Conditions impact the ability to perform a task (e.g., security of lines of communication impact the ability to sustain joint task force operations).**

Measures

Measures **distinguish among varying levels of task performance.** More than one measure may be specified for any single task.

Task:

OP 2.2.1 Collect Information on Operational Situation

Measures:

SCALE	MEASURE
Time	To retask collection asset
Time	Since most current intel. info. was collected
Percent	Of collection requirements filled
Percent	Of collection reqmts filled by multiple sources
Percent	Of targets accurately located
Percent	Of targets accurately identified

Standards

Standards express the **degree to which** (how well) a **military organization** or force **must perform** a **task** under a specified set of **conditions**.

A **criterion** defines **acceptable levels of performance** for a measure and is often expressed as a minimum acceptable level of performance.

Standard:

Criterion	Scale	Measure
90	Percent	of collection requirements filled
4	Hours	since most current intelligence information was collected
85	Percent	of targets accurately located

MS Project Mission thread w/ notes page

The screenshot displays the Microsoft Project interface for a mission thread. The main window shows a Gantt chart with tasks scheduled across eight hours. A task named "MCS A LSI A4.2.1 Conduct Tactical Reconnaissance ART 1.3.3" is selected, and its "Task Information" dialog box is open. The dialog box has tabs for General, Predecessors, Resources, Advanced, Notes, and Custom Fields. The "Notes" tab is active, showing the following text:

Name: MCS A LSI A4.2.1 Conduct Tactical Rec **Duration:** 405m Estimated

Notes:

Purpose: To find and report enemy presense and activity along Axis Maple and on/around Obj Apple and report information about enemy activities.

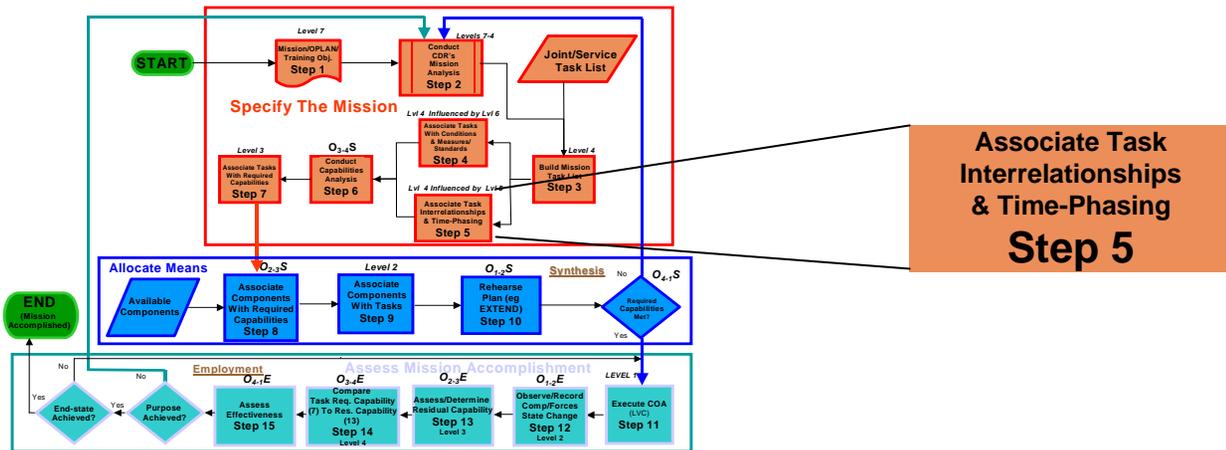
Conditions: MCS A assets have been assigned areas of responsibility to conduct reconnaissance. Both digital and voice communications are established. Net procedures are in place. MCS A has an identified axis of advance. MCS main body is in AP Muldraugh. There is 50% illumination at night and UAV flight patterns have been established. The enemy is occupying defensive positions south of West Point and there are likely enemy forces on the objective. They are light dismounted infantry. The terrain is woodland and rolling hills.

Standards:

MOE Scale Measure
01 Yes/No MCS A reconnaissance assets sensed and reported all enemy activity along Axis Maple and on Objective Apple.

MOP Scale Measure

The dialog box also includes a "Help" button and "OK" and "Cancel" buttons at the bottom.



- During the wargaming process, record the results of the wargaming process. We have done this using MS Project to build a mission file and:
 - Using MS Project functionality to capture task linkages and time phasing by:
 - Describing task attributes (continuous ((I.e. maintain COP)), iterative ((ie disseminate COP)), single instance COA ((ie. Conduct reconnaissance)).
 - Describing task dependencies by linking to predecessor and successor tasks.
 - Identifying and documenting parent and child tasks.
 - Describing task durations (known or estimated) and triggers.

Sample Wargaming Output – Synch Matrix

TIME/EVENT		H - 8	H - hour	H + 8
Enemy Action		Enemy Monitors Movements	Defends from Security Zone	Commits Reserve
Decision Points		Launch Deep Attack		
M A N E U V E R	1st Bde	Move on Route Paula	Cross LD	Seize on OBJ Nick
	2nd Bde	Move on Route Mike	Cross LD	Seize on OBJ Dave
	3rd Bde	Move on Route Sean		FPOL with 1st BDE
	Avn Bde	Deep Attack on OBJ Rose @ H - 1		
	Div Cav		Screen North Flank	
Air Defense		Weapons Hold		
Fire Support		Prep Fires Initiated at H - 5		
Information Operations		Surrender Broadcasts		Enemy C2 Jammed
M/C		Route Maintained		
M/S		MSR Tampa Closed Southbound		
CSS				
C2			TAC CP with Lead Bde	

NOTE: The first column is representative only and can be modified to fit unit needs.

Figure 3-16. Sample Synchronization Matrix Format

Recording Wargame results in Mission Thread

SLAD Demo Tasks(H+90 to H+98)

Task Name	Duration	Start	Finish	Predecessor:	Resource Names
SLAD DEMO PROJECT	0.38 days	Mon 9/6/04	Mon 9/6/04		
H+90 to H+92	0.08 days	Mon 9/6/04	Mon 9/6/04		
LSI A1.5.2 Occupy an Attack/Assault Position (AF	1 hr	Mon 9/6/04	Mon 9/6/04		MCS,ARV,NLOS,C2V
LSI A2.3.1 Collect Relevant Information (ART 7.2.1	2 hrs	Mon 9/6/04	Mon 9/6/04		C2V
LSI A4.2.2 Conduct Surveillance (ART 1.3.4)	2 hrs	Mon 9/6/04	Mon 9/6/04		UAV,ARV
LSI A1.6.2.1.1.4.3 Report Enemy Information	2 hrs	Mon 9/6/04	Mon 9/6/04		
LSI A5.1.2 Detect and Locate Surface targets (AR	2 hrs	Mon 9/6/04	Mon 9/6/04		UAV,ARV
LSI A1.6.2.1.2 Conduct UAV Ops	2 hrs	Mon 9/6/04	Mon 9/6/04		UAV
LSI A4.2.1 Conduct Tactical Reconnaissance	2 hrs	Mon 9/6/04	Mon 9/6/04		UAV,ARV
LSI A1.6.2.1.2.1 Launch and Recover U	2 hrs	Mon 9/6/04	Mon 9/6/04		UAV,ARV,MCS
LSI A1.6.2.1.2.2 Fly UAV Mission	2 hrs	Mon 9/6/04	Mon 9/6/04		UAV,ARV,MCS
H+92 to H+94					
LSI A1.2 Conduct Tactical Maneuver					
LSI A1.2.1.1 Employ Travelling Mov					
LSI A1.2.1.2 Employ Travelling Over					
LSI A1.2.3.3 Exploit Terrain to Exped					
LSI A1.2.4.7.3 Negotiate a Tactical					
LSI A5.1.2 Detect and Locate Surface t					
LSI A1.6.2.1.2 Conduct UAV Ops					
H+94 to H+96					
MTP 17-5-2500.17-KCRW Occupy a Ve					
MTP 17-5-2510.17-KCRW Occupy a Ve					
MTP 17-5-0011.17-KCRW Establish an					
MTP 07-1-1COP.07-C332 Establish the					
LSI X Disseminate the Common Operat					
LSI A1.2.1.2 Employ Travelling Overwat					
LSI A1.2.3.3 Exploit Terrain to Expedite					
LSI A1.5.2 Occupy an Attack/Assault P					
LSI X Employ Networked Fires to Acce					
MTP 07-1-3000.07-C332 Employ Fire S					
LSI A5.1.2 Detect and Locate Surface t					
LSI A1.6.2.1.2 Conduct UAV Ops					
H+96 to H+98					
LSI A5.1.2 Detect and Locate Surface t					
LSI A1.6.2.1.2 Conduct UAV Ops	2 hrs	Mon 9/6/04	Mon 9/6/04		UAV
MTP 07-1-WT06.07.C332 Conduct Battle Tracking	2 hrs	Mon 9/6/04	Mon 9/6/04		C2V

Summary Task Information

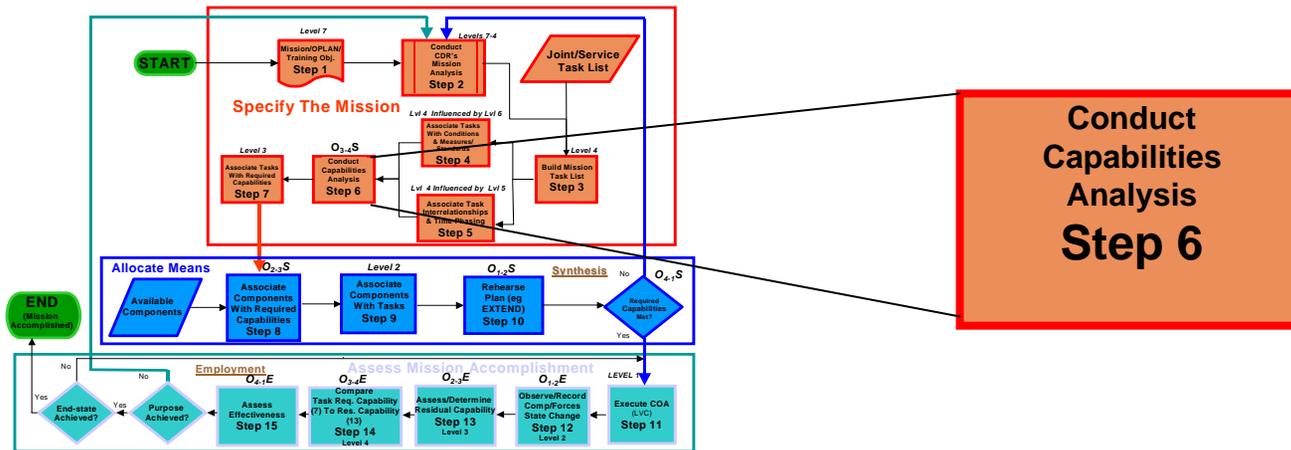
General | Predecessors | Resources | Advanced | Notes | Custom Fields

Name: LSI A1.2 Conduct Tactical Maneuver (A) Duration: 0.08d Estimated

Predecessors:

ID	Task Name	Type	Lag
9	LSI A4.2.1 Conduct Tactical Reconnaissance	Start-to-Start (SS)	1h

Help OK Cancel



- Determine the type and level of functions and capabilities required to enable tasks to satisfy MOPs under the conditions identified
 - Primarily a cognitive process performed by SMEs applying logic, military judgment and experience
 - Function and Capability Descriptions vary, particularly when describing functions and capabilities of formations/organizations versus components/platforms (including people)
 - Requirements documents for Systems and Systems of Systems provide detailed description of functions and capabilities to be delivered (and tested)
 - Bottom-up execution and assessment portion of MMF requires ability to instantaneously compare “required” to “available” capability during execution of mission threads

Sample Cognitive Process for Determining Required Capabilities

Elements of Combat Power	Enemy strengths/ weaknesses	Friendly strengths/ weaknesses	Advantage	
			Friendly	Enemy
MANEUVER	<u>Strength:</u> Infantry with numerous anti-tank weapons. <u>Weakness:</u> Poorly maintained equipment. Lack of mobility between battle positions.	<u>Strength:</u> 3 X M1A2 equip combined arms task forces.	X	
FIREPOWER	<u>Weakness:</u> Limited to mortar fires.	<u>Strength:</u> Air supremacy, unopposed CAS, rocket and cannon fires.	X	
PROTECTION	<u>Strength:</u> Fully constructed defensive position with overhead cover.	<u>Strength:</u> Night vision capability; weapons standoff. <u>Weakness:</u> Soft skin vehicles and dismounted infantry.		X
LEADERSHIP	<u>Strength:</u> Elite unit very disciplined. <u>Weakness:</u> Lack of initiative by subordinates without orders from higher command.	<u>Strength:</u> Combat tested unit. Aggressive and offensive oriented command climate.	X	
INFORMATION	<u>Strength:</u> Full backing of local population and regional press. <u>Weakness:</u> C2 very acceptable to jamming and interception.	<u>Strength:</u> Secure and reliable C2 systems. <u>Weakness:</u> Seen as invaders and occupiers by opposing force and local population.		X

Figure 3-9. Sample Elements of Combat Power Analysis

Describing Levels of Capability – Degraded Capability Elements



C2V

Mobility

- m_1 Reduced maximum speed
- m_2 Reduced maneuverability
- m_3 Stop after t min (leaks)
- m_4 Total immobilization



NLOS
(6)

Firepower

- f_1 Lost ability to fire buttoned-up
- f_2 Degraded delivery accuracy: main
- f_3 Degraded initial rate of fire: main
- f_4 Degraded subsequent rate of fire: main
- f_5 Total loss of firepower: main



ARV-RISTA
(3)

Target Acquisition

- a_1 Lost daylight sights
- a_2 Lost night sights



Class-II UAV
(3)

Surveillance & Reconnaissance

- Z_1 Lost primary sensor
- Z_2 Lost secondary sensor
- Z_3 Lost tertiary sensor
- Z_4 Lost vision blocks

Communication

- X_1 Lost external data
- X_2 Lost external voice
- X_3 Lost internal comms
- X_4 Lost LAN
- X_5 Lost all comms

Survivability

- S_1 Lost NBC protection
- S_2 Lost ability to deploy obscurants
- S_3 Lost silent-watch capability
- S_4 Lost APS
- S_5 Lost secondary armament

Crew

- C_1 Commander incapacitated
- C_2 Squad leader incapacitated
- C_3 Driver incapacitated
- C_4 Operator 1 incapacitated
- C_5 Operator 2 incapacitated
- C_6 Gunner incapacitated
- C_7 Loader incapacitated

Other Mission Functions

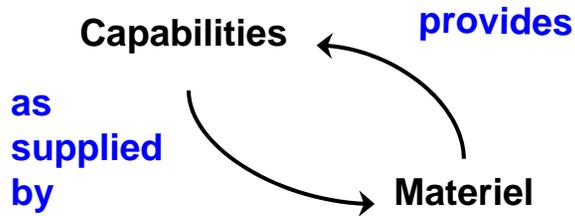
- O_1 Lost situational awareness

Catastrophic Loss

- k_1 Lost every capability (fuel fire, ammo detonation, ...)

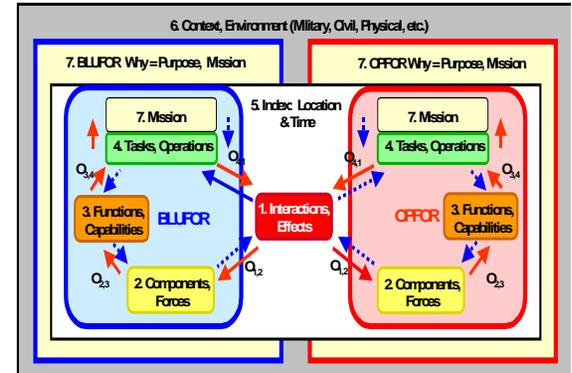
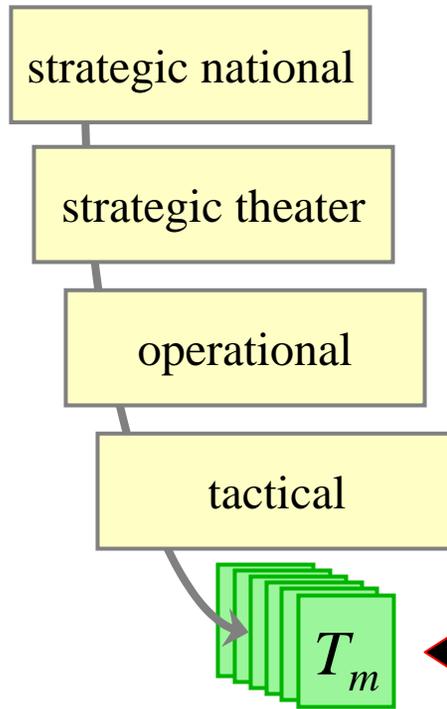
O&O Capabilities Mapped to Materiel via ORD & PCDs

(What materiel will be assessed to evaluate capability of interest?)

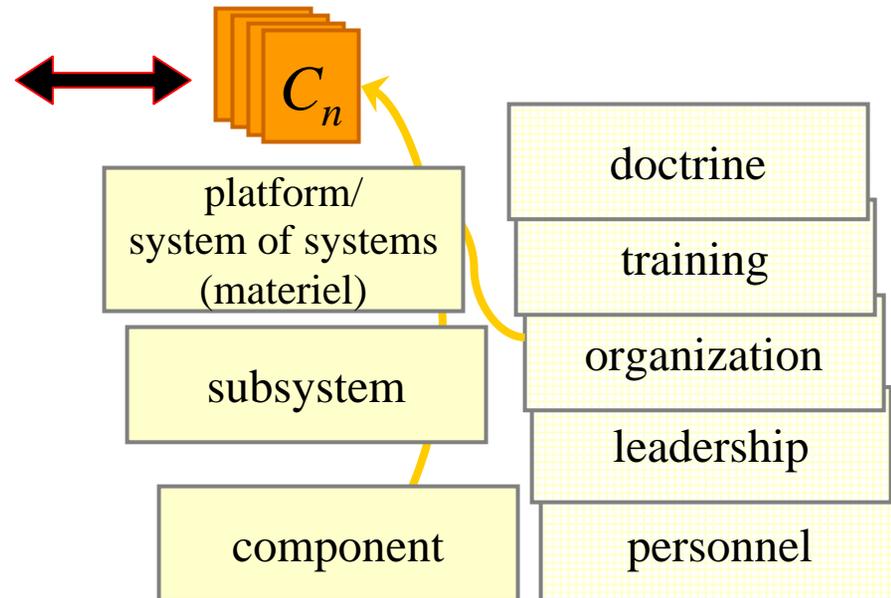


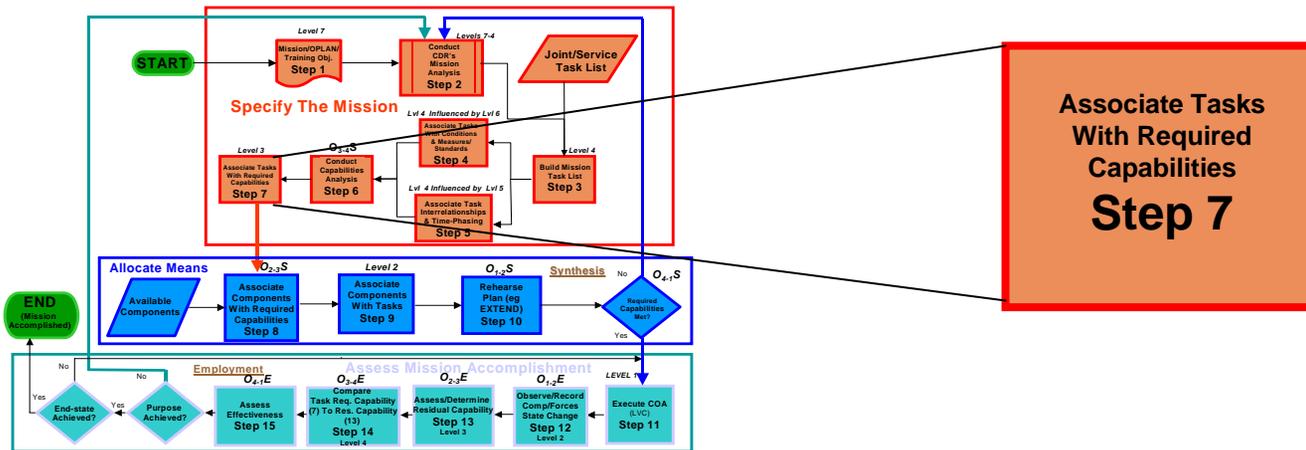
O&O Capability	ORD Reference #	Procurement Control Drawings (PCD)
F15: Enable continuous situational understanding through networked force	2392	786-300151
	2314	786-30093, Integrated Computers; 786-30143, Network Management
	2365	786-30093, Integrated Computers; 786-30143, Network Management; 786-30151
	2661	786-30018, Class III UAV; 786-30019, Class II UAV; 786-30020, Class I UAV; 786-30028; 786-30146, Situation Understanding (SU) SSS; 786-30151
	2869	786-30131, Tactical UGS System; 786-30132, Urban UGS System; 786-30144, C2 Battle Command & Mission Execution SSS; 786-30145, C2 Planning & Preparation SSS; 786-30151
F16: Facilitate automatic language translation	1040	786-30093, Integrated Computers
F17: Enable information exchange via adaptive, integrated communications	1016	786-300144, C2 Battle Command & Mission Execution SSS; 786-300145, C2 Planning & Preparation SSS; 786-300148; 786-300149, Warfighter Machine Interface (WMI); 786-300151; WIN-T; JTRS
	1120	786-30140, Ground Vehicle Communications; 786-30143, Network Management; 786-30149, Warfighter Machine Interface (WMI); 786-30151
	1148	786-30018, Class III UAV; 786-30019, Class II UAV; 786-30020, Class I UAV; 786-30022, Armed Robotic Vehicle (ARV); 786-30025, Small UGV (SUGV); 786-30093, Integrated Computers; 786-30151

Comparing Required to Available



Is this a **mission capability package** that meets the **mission capability requirement**?

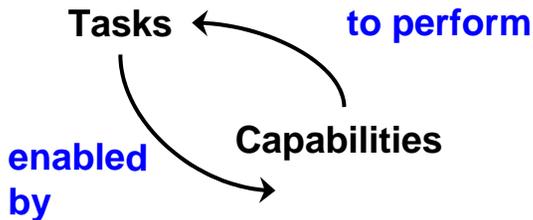




- From T&E perspective, this enables
 - Test and Evaluation planning to focus on activities that will most efficiently ensure ability to exercise, observe and assess capabilities
 - Ideally will be able to describe required capabilities in terms of:
 - MOPs and the associated capability categories for each task in a familiar and easily understood format for military users; and,
 - Unacceptable levels of capability degradation using capability elements in a familiar, easily understood and machine processable form for technical users.

Test and Evaluation Perspective -- (What must be done in a test to enable evaluation of capabilities?)

O&O Capabilities

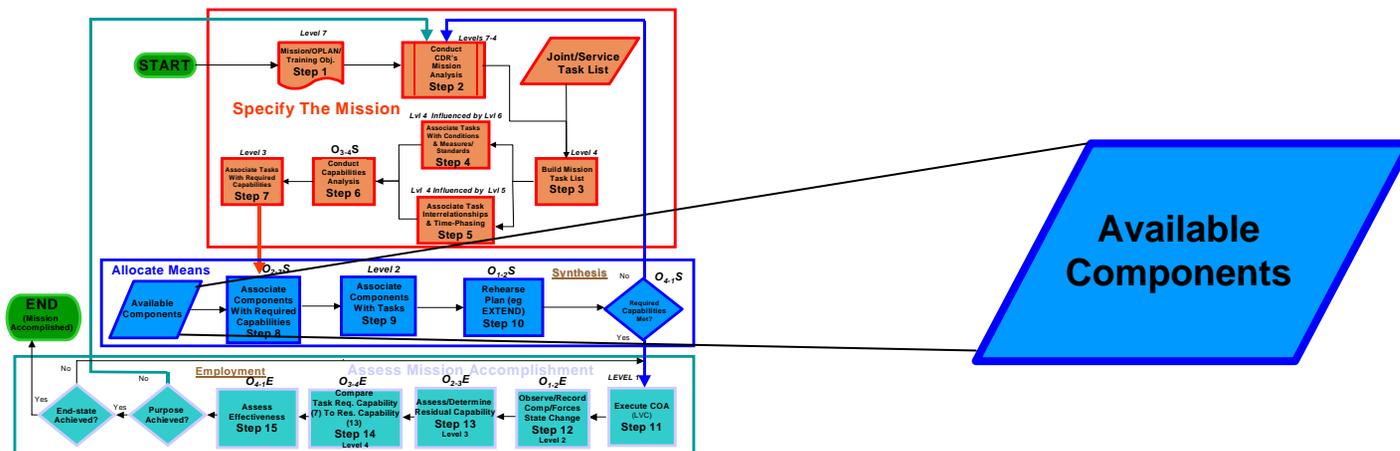


TASK	AUTL Ref #	F12: Enable dissemination of tactical scheme	F15: Enable continuous situational understanding through networked force	F16: Facilitate automatic language translation	F17: Enable information exchange via adaptive, integrated communications	F18: Detect/prevent intruders/malicious software; identify points of intrusion/origin, information compromised/introduced into the network	F19: Enable Positional Navigation (POSNAV)	F20: Enable information management to fuse, monitor and disseminate information to support CCIR, combat action, decision-making and analysis	F21: Establish an adaptive learning repository to build and manage a library of friendly and enemy DTLOMS and lessons learned	F22: Enable terrain analysis	F23: Integrate synergistic use of ISR to see the full range of operational variables
Manage Tactical Information	ART 7.2		x	x	x	/		x			x
Process Relevant Information to Create a Common Operational Picture	ART 7.2.2		x	/	/	x	/	x	x	x	/
Display a Common Operational Picture (COP) Tailored to User Needs	ART 7.2.3	/	x	x	/	/		/			
ART 7.2.4 Store Relevant Information											
Disseminate COP and Execution Information to Higher, Lower, Adjacent, Supported, and Supporting Organizations	ART 7.2.5	x	x	/	x	/		/			/
ART 7.2.6 Communicate with Non-English Speaking Forces and Agencies											

Red with an X = Direct enabler of intent of task
Yellow with a / = Enables performing task to standard

Tasks ↔ Capabilities: Linking it all Together

1	Lines from the TOEL		TASKS	PLATFORM	Comms						
51	0200-1000	ART 7.2	*MTP 17-5-0011.17-KCRW Establish and Maintain Communications	ARV 2	x0		x2	x3	x4		
52	0412-0417	ART 7.2	*LSI A1.6.2.1.1.4.3 Report Enemy Information	ARV 2	x0		x2	x3	x4		
53	0200-1000	ART 7.2	*MTP 17-5-0011.17-KCRW Establish and Maintain Communications	ARV 3	x0		x2	x3	x4		
54	0757-0802	ART 7.2	*LSI A1.6.2.1.1.4.3 Report Enemy Information	ARV 3	x0		x2	x3	x4		
55	0200-1000	ART 7.2	*MTP 07-1-1COP.07-C332 Establish the Common Operational Picture	C2V	x0	x1	x2	x3	x4	x5	
56	0200-0205, 0253-0258, 0308-0313, 0341-0346, 0437-0442, 0525-0530, 0633-0638, 0707-0712, 0800-0805, 0849-0854	ART 7.2	*ART 7.2.5 Disseminate Common Operational Picture and Execution Information	C2V	x0	x1	x2	x3	x4	x5	
57	0200-1000	ART 7.2	LSI A2.3.1 Collect Relevant Information ART 7.2.1	C2V	x0	x1	x2	x3	x4	x5	
58	0200-1000	ART 7.2	MTP 07-1-WT06.07-C332 Conduct Battle Tracking	C2V	x0	x1	x2	x3	x4	x5	
59	0200-1000				x0	x1	x2	x3	x4	x5	
60	0255-0300 0339-0344 0523-0528 0706-0711	 C2V	Mobility m_1 Reduced maximum speed m_2 Reduced maneuverability m_3 Stop after t min (leaks) m_4 Total immobilization	Surveillance & Reconnaissance Z_1 Lost primary sensor Z_2 Lost secondary sensor Z_3 Lost tertiary sensor Z_4 Lost vision blocks	Crew C_1 Commander incapacitated C_2 Squad leader incapacitated C_3 Driver incapacitated C_4 Operator 1 incapacitated C_5 Operator 2 incapacitated C_6 Gunner incapacitated C_7 Loader incapacitated	x0	x1	x2	x3	x4	x5
61	0250-0255	 NLOS (6)	Firepower f_1 Lost ability to fire buttoned-up f_2 Degraded delivery accuracy: main f_3 Degraded initial rate of fire: main f_4 Degraded subsequent rate of fire: main f_5 Total loss of firepower: main	Communication X_1 Lost external data X_2 Lost external voice X_3 Lost internal comms X_4 Lost LAN X_5 Lost all comms	Other Mission Functions O_1 Lost situational awareness	x0	x1				
62	030-0335				x0	x1					
63	0340-0835	 ARV-RISTA (3)			x0	x1					
64	0431-0436				x0	x1					
65	0543-1000	 Class-II UAV (3)	Target Acquisition a_1 Lost daylight sights a_2 Lost night sights	Survivability S_1 Lost NBC protection S_2 Lost ability to deploy obscurants S_3 Lost silent-watch capability S_4 Lost APS S_5 Lost secondary armament	Catastrophic Loss k_1 Lost every capability (fuel fire, ammo detonation, ...)	x0	x1				

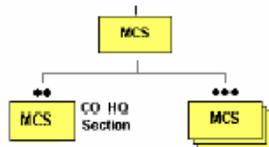


- Determine forces and associated MTOE type data that are to be included in the test.
 - Test Objectives and nature of the test (i.e. DT, OT, etc.) or test event may drive determination.
 - Use available source documents (i.e., ORD, O&O, Systems Book, etc.) to understand organization and platform required capabilities, limitations, intended use, etc. Incorporate this information into wargaming and determination of task MOPs.
 - ARL-SLAD used the documentation above and other technical documentation to generate or select substitute platform (i.e. Stryker, Paladin, etc.) tables of capability categories and degraded capability elements to support analysis of platforms to be modeled

MCS A Company Organization

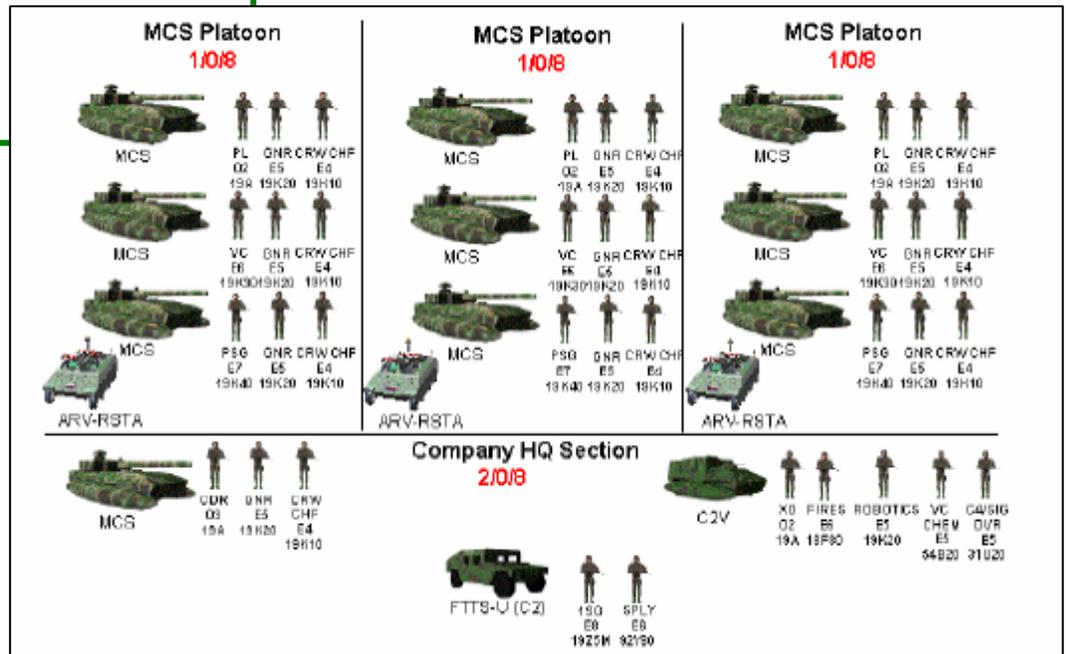
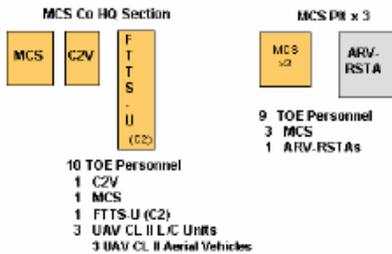
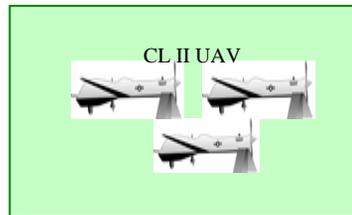
Mounted Combat System Company

Mounted Combat System Company X 2

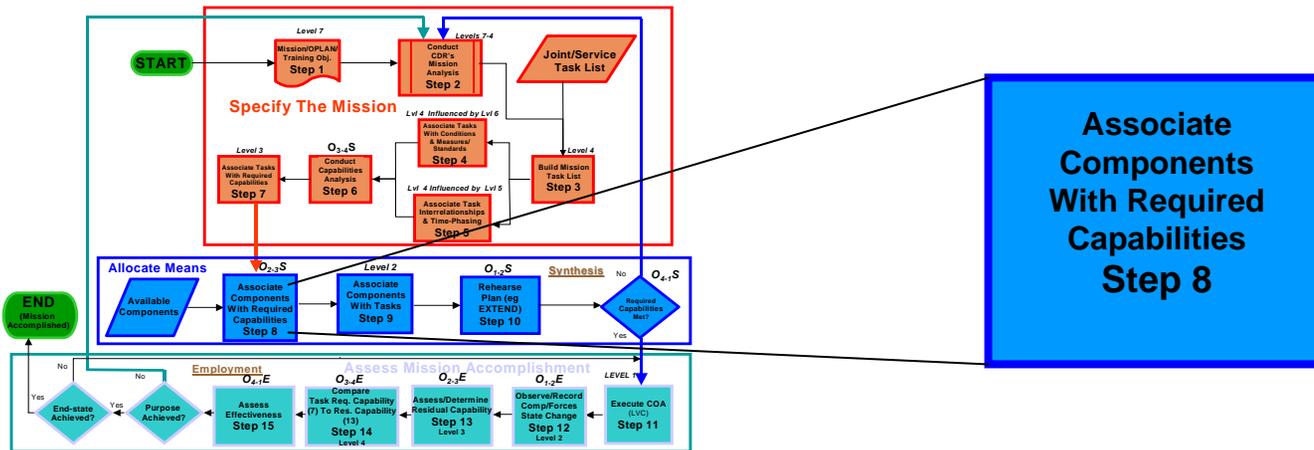


37 TOE Personnel

- 10 Mounted Combat Systems (MCS)
- 1 C2V
- 3 ARV-RSTAs (6 Ton Variant)
- 1 FTTS-U (C2)
- 3 UAV CL II L/C Units
- 3 UAV CL II Aerial Vehicles

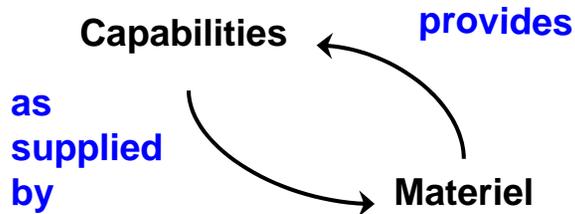


TRADOC PAM 525-3-90
Maneuver O & O, June 2003



- From T&E perspective this will normally be provided in Requirements Documentation
- Can be a challenge to pull together data for current systems and forces
- Especially challenging to gather data for degraded capability caused by changes in systems and forces

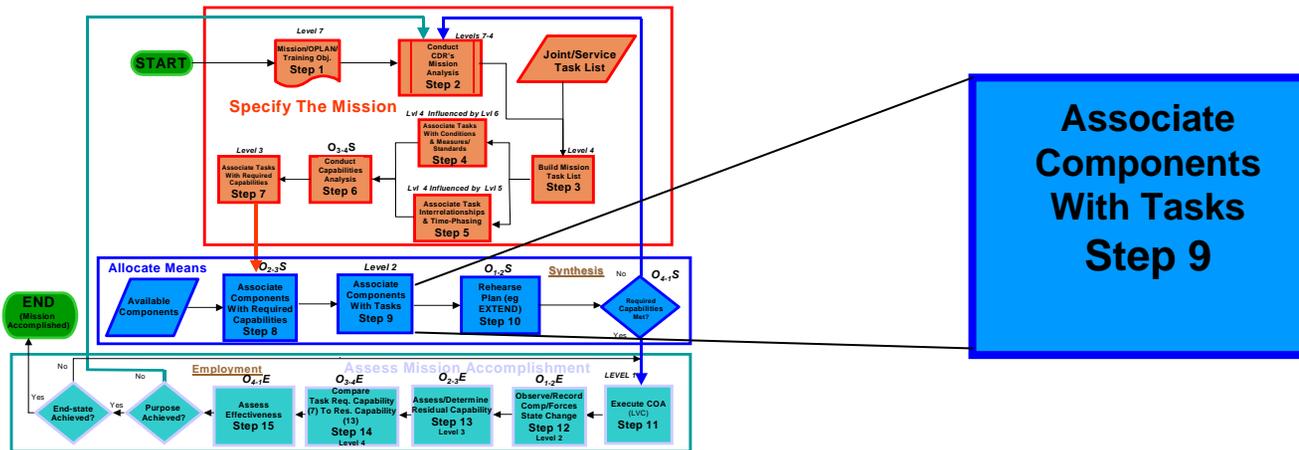
Testing and Evaluation Perspective -- (What materiel will be assessed to evaluate capability of interest?)



O&O Capability	ORD Reference #	Procurement Control Drawings (PCD)
F15: Enable continuous situational understanding through networked force	2392	786-300151
	2314	786-30093, Integrated Computers; 786-30143, Network Management
	2365	786-30093, Integrated Computers; 786-30143, Network Management; 786-30151
	2661	786-30018, Class III UAV; 786-30019, Class II UAV; 786-30020, Class I UAV; 786-30028; 786-30146, Situation Understanding (SU) SSS; 786-30151
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F16: Facilitate automatic language translation	1040	786-30093, Integrated Computers
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Matching Components to Required Capabilities

C58						
Capability Category	MOBILITY	FIREPOWER	COMMUNICATIONS	SURVIVABILITY	TARGET ACQUISITION	SURVEILLANCE
Platform	A quality or capability of military forces which permits them to move from place to place while retaining the ability to fulfill their primary mission.	The amount of fire which may be delivered by a position, unit, or weapon system. 2. Ability to deliver fire.	The means or method to convey information of any kind from one person or place to another.	Concept which includes all aspects of protecting personnel, weapons, and supplies while simultaneously deceiving the enemy. Survivability tactics include building a good defense; employing frequent movement; using concealment, deception, and camouflage; and constructing fighting and protective positions for both individuals and equipment.	The detection, identification, and location of a target in sufficient detail to permit the effective employment of weapons.	The systematic observation of aerospace, surface, or subsurface areas, places, persons, or things, by visual, aural, electronic, photographic, or other means.
AIRCRAFT						
Rotary Wing	X	X	X	X	X	
Fixed Wing	X		X	X	X	
UAVs	X	X	X	X	X	X
Air Traffic Control Systems			X	X		X
Aircraft Rockets	X	X			X	
AIR DEFENSE SYSTEMS	X	X	X	X	X	
ANTIARMOR WEAPONS	X	X		X	X	
C4I SYSTEMS						
Digital Battle Command			X			
C4 Support to Air & Missile Defense			X		X	X
C4 Support to Network Operations			X			
C4 Support to Intelligence Operations			X		X	X
Sensor / Sensor Systems	X			X	X	X
Night Vision Sensors			X	X	X	X
Aircraft Survivability Equipment				X		
Radios & Communication Systems			X	X		
ENGINEER & COUNTERMINE EQUIPMENT						
Engineer Equipment	X		X	X		



- From T&E perspective, the O&O plan and follow on documentation such as Operational Mode Summary – Mission Statements will provide the association for specific mission sets
- This information is useful for constructing mission threads and TOELs for use in test events and for tying together discrete test events (i.e. live fire or developmental tests) being performed as part of a larger, distributed test construct.

Matching Components (Platforms and Units) to Tasks – Task Organize

<div style="text-align: center;">  </div>	Tactical UAV	Large FW UAV	VTOL UAV		M1A2	M113 A3
Link to Equipment Data Sheet	UAV Shadow 200	Predator UAV	UAV A160 Hummingbird		M1A2	M113
Chapter 1 ART 1.0: The Intelligence Battlefield Operating System						
SECTION I ART 1.1: SUPPORT TO SITUATIONAL UNDERSTANDING	X	X	X			
ART 1.3.3 CONDUCT TACTICAL RECONNAISSANCE	X	X			X	X
ART 1.3.3.1 CONDUCT A ZONE RECONNAISSANCE	X	X			X	X
ART 1.3.3.2 CONDUCT AN AREA RECONNAISSANCE	X	X			X	X
ART 1.3.3.3 CONDUCT A RECONNAISSANCE-IN-FORCE					X	X
ART 1.3.3.4 CONDUCT A ROUTE RECONNAISSANCE	X	X			X	X
ART 1.3.3.5 CONDUCT A RECONNAISSANCE PATROL					X	X
ART 1.3.4 CONDUCT SURVEILLANCE	X	X	X		X	X
Chapter 2 ART 2.0: The Maneuver Battlefield Operating System						
ART 2.2.2 CONDUCT ACTIONS ON CONTACT					X	X
ART 2.2.3 EMPLOY COMBAT PATROLS					X	X
ART 2.2.4 CONDUCT COUNTERAMBUSH ACTIONS					X	X
ART 2.2.5 EXPLOIT TERRAIN TO EXPEDITE TACTICAL MOVEMENTS					X	X

Matching Components to Tasks

SLAD Demo Tasks(H+90 to H+98)

Task Name	Duration	Start	Finish	Predecessor	Resource Names
SLAD DEMO PROJECT	0.38 days	Mon 9/6/04	Mon 9/6/04		
H+90 to H+92	0.08 days	Mon 9/6/04	Mon 9/6/04		
LSI A1.5.2 Occupy an Attack/Assault Position (AF	1 hr	Mon 9/6/04	Mon 9/6/04		MCS,ARV,NLOS,C2V
LSI A2.3.1 Collect Relevant Information (ART 7.2.1	2 hrs	Mon 9/6/04	Mon 9/6/04		C2V
LSI A4.2.2 Conduct Surveillance (ART 1.3.4)	2 hrs	Mon 9/6/04	Mon 9/6/04		UAV,ARV
LSI A1.6.2.1.1.4.3 Report Enemy Information	2 hrs	Mon 9/6/04	Mon 9/6/04		
LSI A5.1.2 Detect and Locate Surface targets (AR	2 hrs	Mon 9/6/04	Mon 9/6/04		UAV,ARV
LSI A1.6.2.1.2 Conduct UAV Ops	2 hrs	Mon 9/6/04	Mon 9/6/04		UAV
LSI A4.2.1 Conduct Tactical Reconnaissance	2 hrs	Mon 9/6/04	Mon 9/6/04		UAV,ARV
LSI A1.6.2.1.2.1 Launch and Recover UAV	2 hrs	Mon 9/6/04	Mon 9/6/04		UAV,MCS
LSI A1.6.2.1.2.2 Fly UAV Mission					UAV,C2V
H+92 to H+94					
LSI A1.2 Conduct Tactical Maneuver					
LSI A1.2.1.1 Employ Travelling Mov					MCS
LSI A1.2.1.2 Employ Travelling Over					MCS
LSI A1.2.3.3 Exploit Terrain to Exped					MCS,ARV,NLOS,C2V
LSI A1.2.4.7.3 Negotiate a Tactical					MCS,ARV,NLOS,C2V
LSI A5.1.2 Detect and Locate Surface t					UAV,ARV
LSI A1.6.2.1.2 Conduct UAV Ops					UAV
H+94 to H+96					
MTP 17-5-2500.17-KCRW Occupy a Ve					MCS,NLOS
MTP 17-5-2510.17-KCRW Occupy a Ve					MCS
MTP 17-5-0011.17-KCRW Establish an					All
MTP 07-1-1COP.07-C332 Establish the					C2V
LSI X Disseminate the Common Operat					C2V
LSI A1.2.1.2 Employ Travelling Overwat					MCS
LSI A1.2.3.3 Exploit Terrain to Expedite					MCS,ARV,NL
LSI A1.5.2 Occupy an Attack/Assault P					MCS,NLOS,C2V
LSI X Employ Networked Fires to Acce					NLOS
MTP 07-1-3000.07-C332 Employ Fire S					NLOS
LSI A5.1.2 Detect and Locate Surface t					UAV,ARV
LSI A1.6.2.1.2 Conduct UAV Ops					UAV
H+96 to H+98					
LSI A5.1.2 Detect and Locate Surface t					UAV,AF
LSI A1.6.2.1.2 Conduct UAV Ops					UAV
MTP 07-1-WT06.07.C332 Conduct Battle Tracking	2 hrs	Mon 9/6/04	Mon 9/6/04		C2V

Summary Task Information

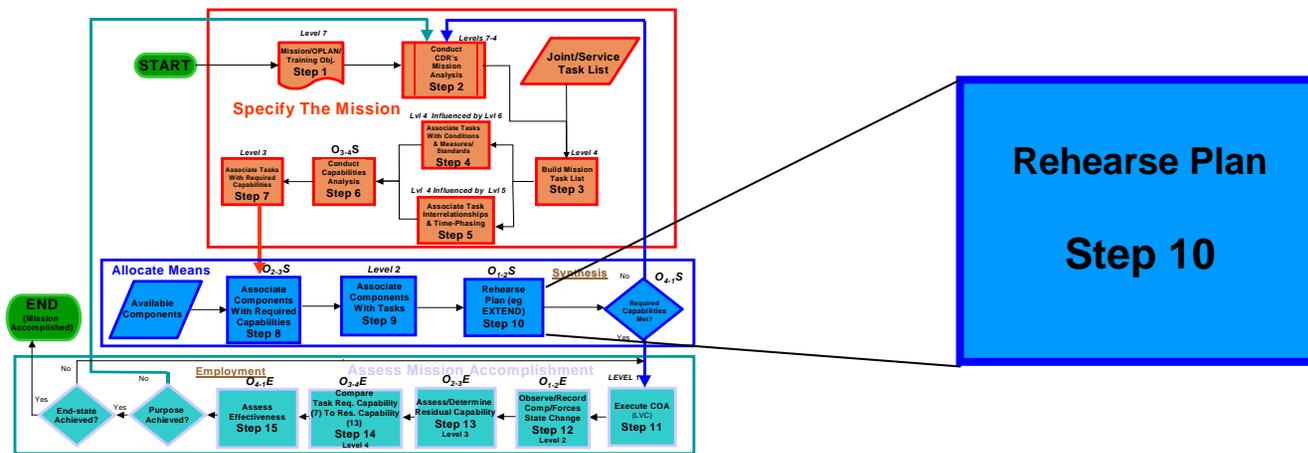
General | Predecessors | Resources | Advanced | Notes | Custom Fields

Name: LSI A1.2 Conduct Tactical Maneuver (A) Duration: 0.08d Estimated

Predecessors:

ID	Task Name	Type	Lag
9	LSI A4.2.1 Conduct Tactical Reconnaissance	Start-to-Start (SS)	1h

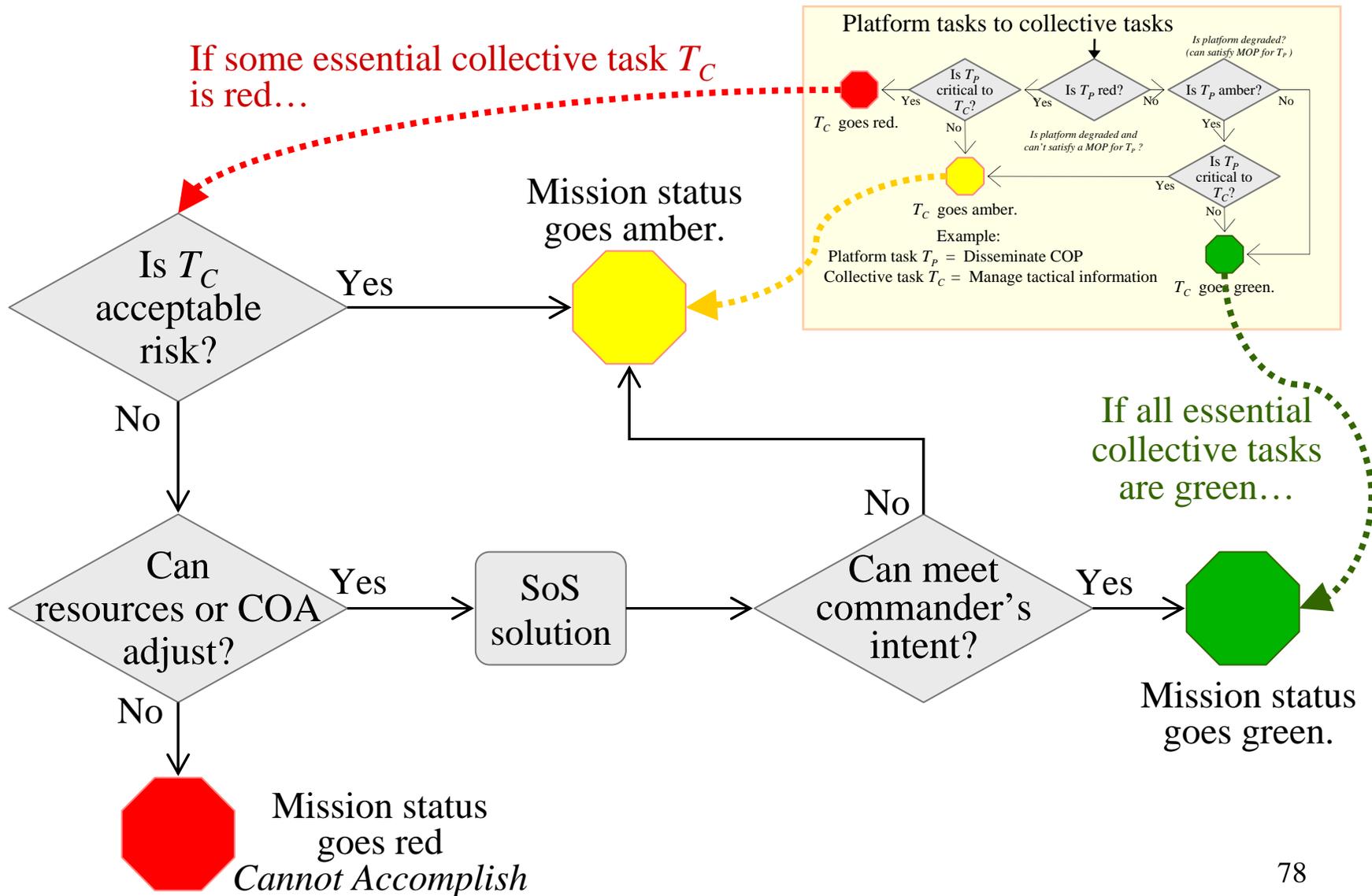
Help OK Cancel



**Rehearse Plan
Step 10**

- Test completed mission threads in a live, virtual, constructive, or combination environment. For example, DRC and Northrop-Grumman SMEs worked together to develop a “what if” simulation model, built using the EXTEND tool, that used products developed during steps 1-9 along with a Decision Making Process flow chart to execute the following processes:
 - Event generation
 - Component, Sub-system, Capability State changes
 - Determine platform task status, collective task status, mission task status
- And produce the following displays and outputs:
 - Current platform capability
 - Current platform task ability
 - Current collective task status
 - Current mission assessment status
 - Record of state changes, task status changes, mission health status changes

Decision Making Process Flow Chart



EXTEND Tool Use to Construct Mission and Means Capability Degradation Model (M2CDM) to:

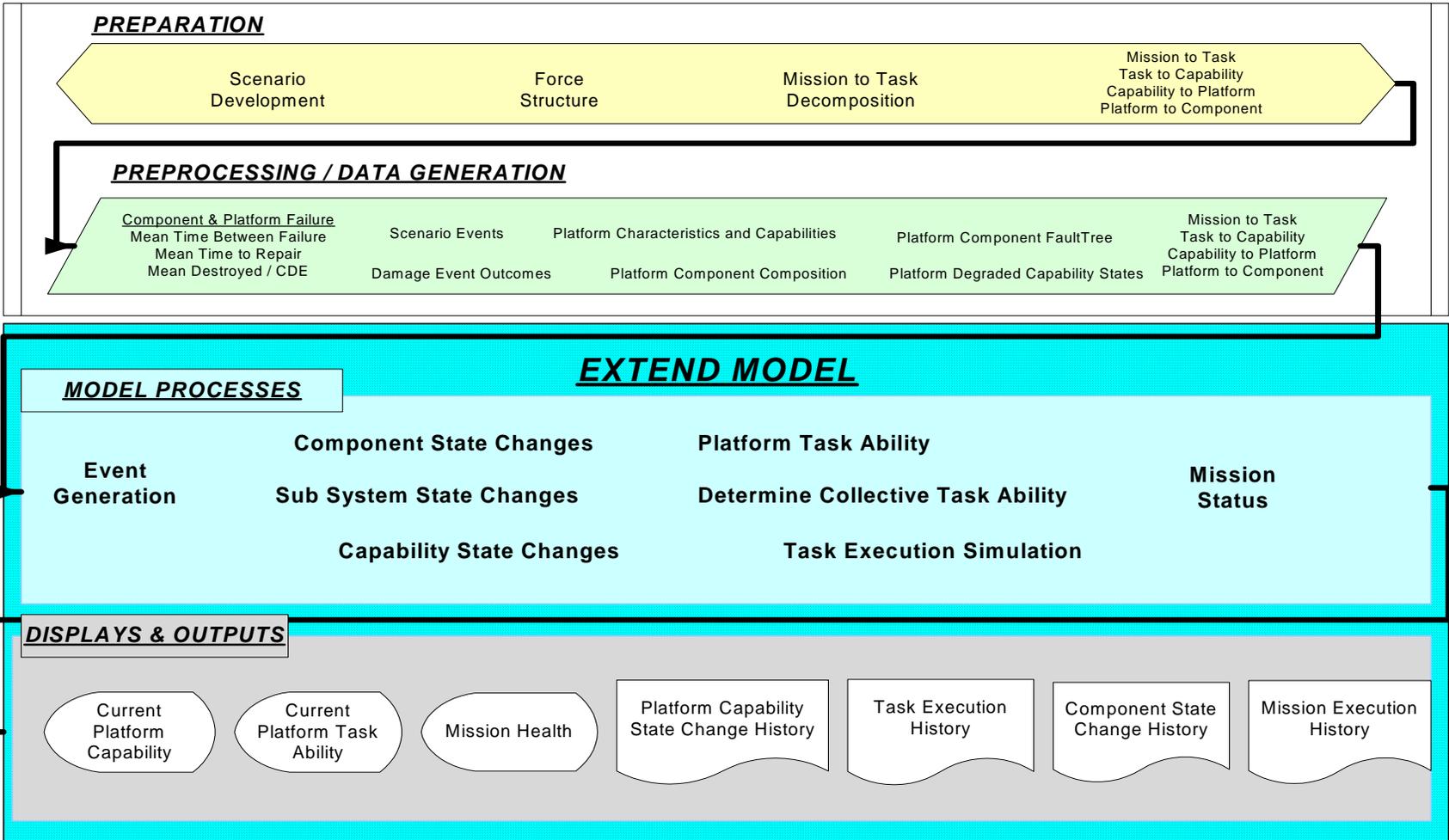
- Map component-level state changes to platform level capabilities
- Map platform level capabilities to ability to perform tasks
- Map ability to perform tasks to mission success

Initialization data requirements for M2CDM

- Tactical Scenario
- Military Organizations and Equipment
- Important Data Elements
 - Platform to Task Relationships
 - Sequence of Events
 - Effect of Component Loss on Platform Capability
 - Effect of Degraded Capability on Task Accomplishment

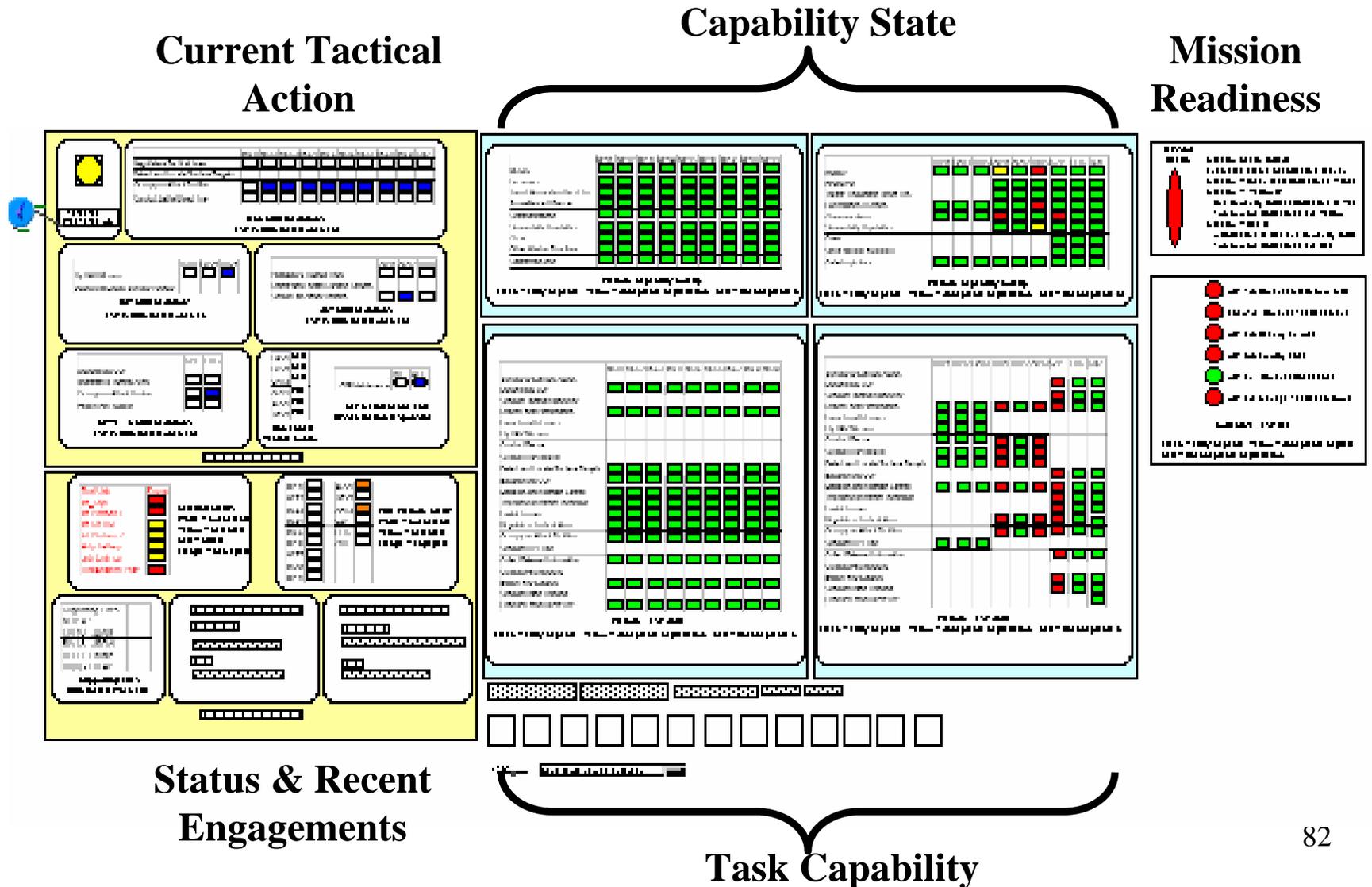
TOP LEVEL FLOWCHART MMF PROOF OF CONCEPT MODEL

MODEL PURPOSE: *Does the Mission Capability Package Meet the Mission Capability Requirement?*



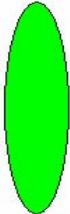
Missions and Means

Degraded Capabilities Model (M2DCM)



Mission Readiness

Mission Health



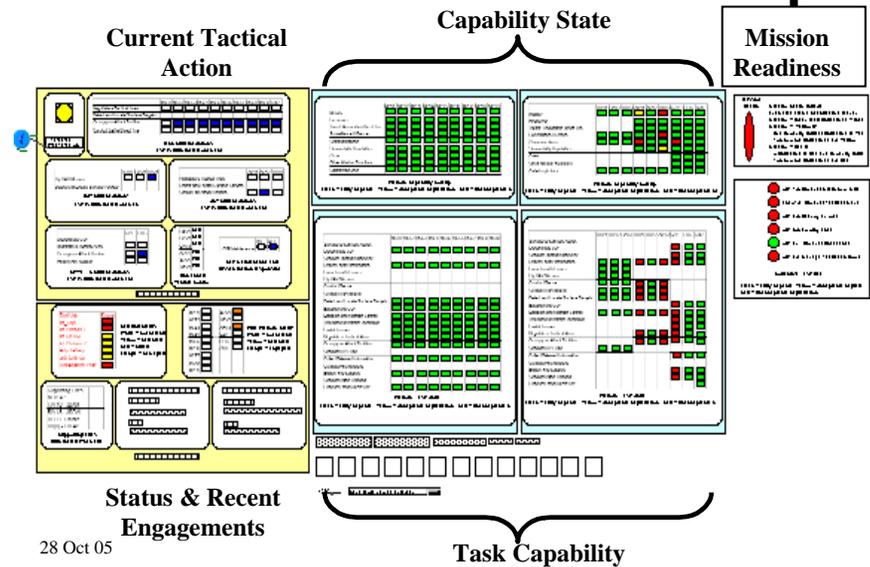
Mission Health Criteria
Evaluates status of collective tasks.
Mission = Green if all Collectives = Green
Mission = Yellow if:
One Currently Critical Collective is Yellow, or
Two or more Collectives are Yellow
Mission = Red if
A Collective is Red and Currently Critical
Two or more Collectives are Red

-  ART 1.3 Conduct Intell, Surv & Recce)
-  LSI A1.2 Conduct Tactical Maneuver
-  ART 2.5 Occupy an Area
-  ART 3.3 Employ Fires
-  ART 2.4 Conduct Direct Fires
-  ART 7.2 Manage Tactical Information

Collective Task Health
**Green = Fully Capable Yellow = Acceptable Degradatio
Red = Unacceptable Degradation**



Missions and Means Degraded Capabilities Model (M2DCM)



Task Capability

Fly UAV Mission									
Conduct Recce									
Conduct Surveillance									
Detect and Locate Surface Targets	Green								
Establish the COP	Green								
Establish and Maintain Commo	Green								
Traveling Movement Technique	Green								
Exploit Terrain	Green								
Negotiate a Tactical Area	Green								
Occupy an Attack Position	Green								
Conduct UAV Ops									
Collect Relevant Information	Green								
Conduct Fire Missions									
Employ Fire Support	Green								
Conduct Battle Tracking									
Conduct Lethal Direct Fire	Green								

Platform Task Ability

Green = Fully Capable Yellow = Acceptable Degradation Red = Unacceptable Degradation

MCS

ARV

C2V and FTTS

UAV

Red Units

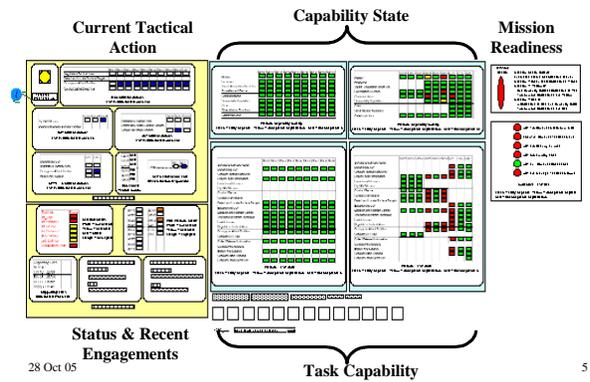
Bn HQ

Comp & Cap

Metrics

Ar

T=



Current Tactical Action

event
count

Day or Night

10/27/2004
Wed 12:00 AM

	MCS
Negotiate a Tactical Area	
Detect and Locate Surface Targets	
Occupy an Attack Position	■
Conduct Lethal Direct Fire	

Task is

	UAV1	UAV2	UAV3
Fly UAV Mission			■
Detect and Locate Surface Targets			

UAV Current Actions
Task is illuminated when active

	C2V	FTTS
Disseminate COP		
Negotiate a Tactical Area		
Occupy an Attack Position	■	■
Employ Fire Support		

C2V/FTTS Current Actions
Task is illuminated when active

CURRENT TACTICAL ACTION

FCS
DRC

Missions and Means
Degraded Capabilities Model (M2DCM) AMSAA

Current Tactical Action

Capability State

Mission Readiness

Status & Recent Engagements

28 Oct 05

Task Capability

Red Unit	Status
Inf Sqd	■
Inf Platoon 1	■
Inf Co HQ	■

Red Unit Status
White = Not Detected
Yellow = Detected

MCS1	■	ARV1	
MCS2	■	ARV2	
MCS3	■	ARV3	
MCS4		C2V	■
MCS5		FTTS	■

Blue Platform Status
White = Not Detected
Yellow = Detected

Status & Recent Engagements

Red Unit	Status
Inf Sqd	[Red]
Inf Platoon 1	[Red]
Inf Co HQ	[Red]
Inf Platoon 2	[Red]
Arty battery	[Red]
anti tank co	[Red]
Observation Post	[Red]

Red Unit Status
 White = Not Detected
 Yellow = Detected
 Red = Killed
 Orange = Damaged

MCS1	[Yellow]	ARV1	[White]
MCS2	[Yellow]	ARV2	[White]
MCS3	[Yellow]	ARV3	[White]
MCS4	[White]	C2V	[Yellow]
MCS5	[White]	FTTS	[Yellow]
MCS6	[Yellow]	CDR	[Yellow]
MCS7	[Yellow]		
MCS8	[White]		
MCS9	[Yellow]		

Blue Platform Status
 White = Not Detected
 Yellow = Detected
 Orange = Engaged

Supporting Fires	
NLOS-C	
F/A 18 - JDAM	
F/A 18 - JSOW	
HELO - Hellfire	
DD(X) - LRLAP	

Supporting Fires
 Illuminated When Firing

Most Recent Engagement By Blue Firing Platform

[Target Bar]

Target

[Target Bar]

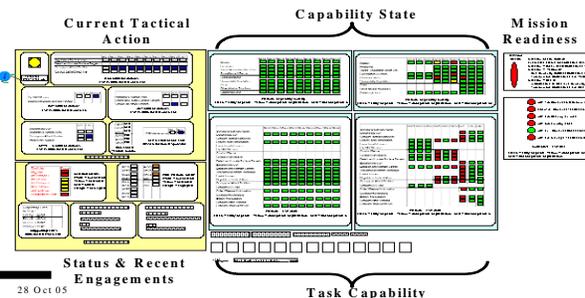
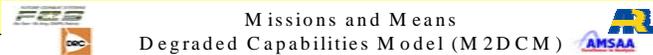
Most Recent Engagement By Red Firing Platform

[Target Bar]

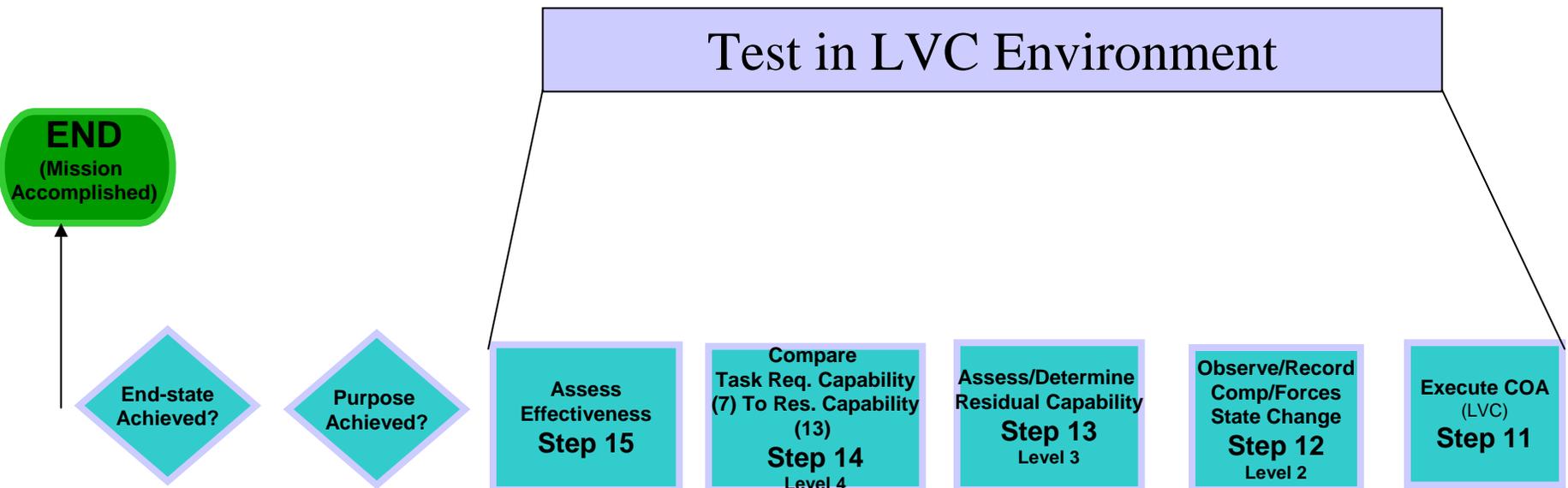
Target

[Target Bar]

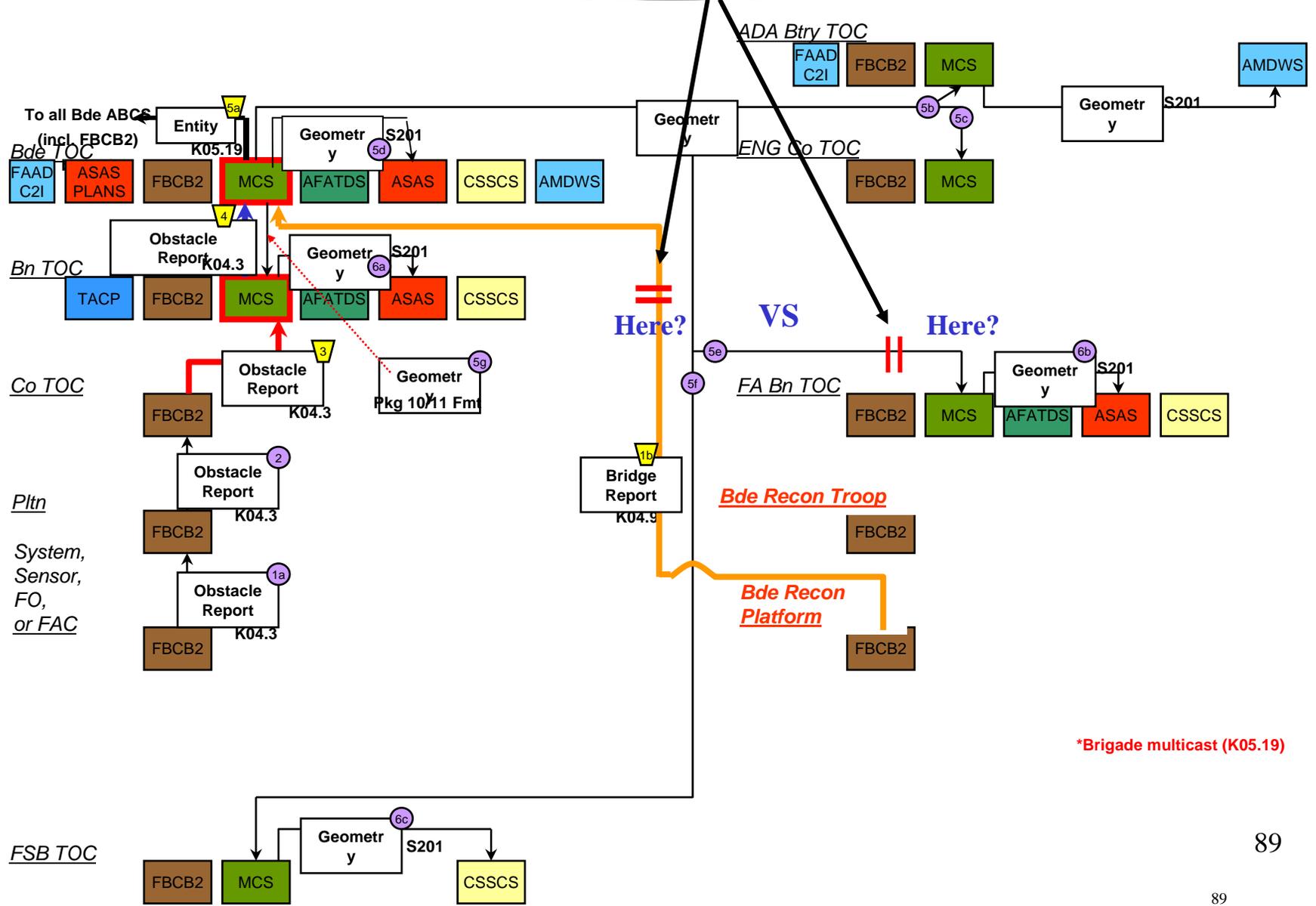
MOST RECENT ENGAGEMENT 1



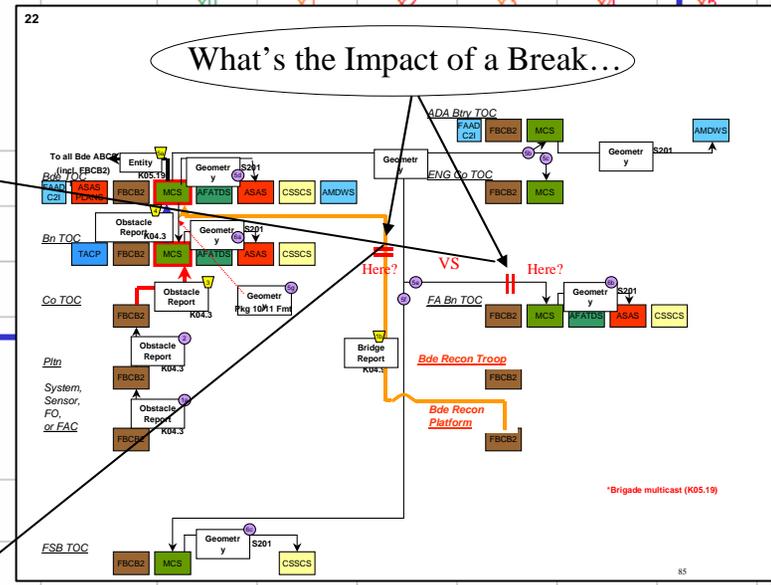
- Application of the previous ten steps of the process results in sufficiently rigorous specification of the mission to gain meaningful data from execution in LVC environment
- This is particularly useful for evaluating Effectiveness, Suitability and Survivability
- Challenge is finding the appropriate execution environment that provides a sufficient level of granularity and fidelity to permit observation, evaluation and assessment of tasks against MOEs and MOPs. Execution plan may drive requirements for models and simulations not currently available



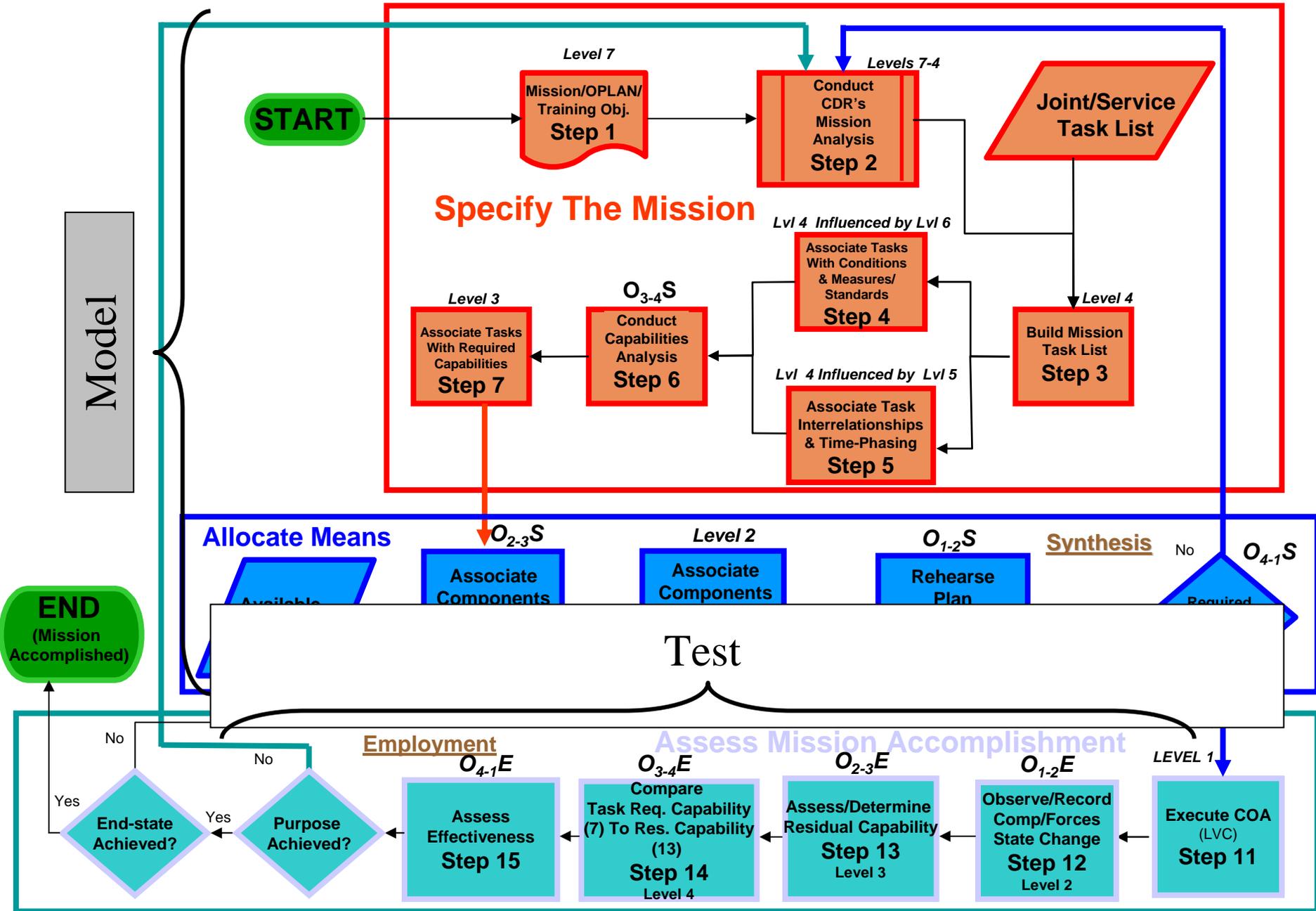
What's the Impact of a Break...



Lines from the TOEL	TASKS	PLATFORM	Comms					
0200-1000	ART 7.2	*MTP 17-5-0011.17-KCRW Establish and Maintain Communications	ARV 2	x0	x2	x3	x4	
0412-0417	ART 7.2	*LSI A1.6.2.1.1.4.3 Report Enemy Information	ARV 2	x0	x2	x3	x4	
0200-1000	ART 7.2	*MTP 17-5-0011.17-KCRW Establish and Maintain Communications	ARV 3	x0	x2	x3	x4	
0757-0802	ART 7.2	*LSI A1.6.2.1.1.4.3 Report Enemy Information	ARV 3	x0	x2	x3	x4	
0200-1000	ART 7.2	*MTP 07-1-1COP.07-C332 Establish the Common Operational Picture	C2V	x0	x1	x2	x3	x4
0200-0205, 0253-0258, 0308-0313, 0341-0346, 0437-0442, 0525-0530, 0633-0638, 0707-0712, 0800-0805, 0849-0854	ART 7.2	*ART 7.2.5 Disseminate Common Operational Picture and Execution Information	C2V	x0	x1	x2	x3	x4
0200-1000	ART 7.2	LSI A2.3.1 Collect Relevant Information ART 7.2.1	C2V					
0200-1000	ART 7.2	MTP 07-1-WT06.07-C332 Conduct Battle Tracking	C2V					
0200-1000	ART 7.2	*MTP 17-5-0011.17-KCRW Establish and Maintain Communications	C2V					
0255-0300, 0313-0318, 0339-0344, 0410-0415, 0523-0528, 0612-0617, 0706-0711, 0750-0755, 0844-0849	ART 7.2	*LSI A1.6.2.1.1.4.3 Report Enemy Information	C2V					
0210-0542	ART 7.2	*MTP 17-5-0011.17-KCRW Establish and Maintain Communications	UAV 1					
0250-0255, 0305-0310, 030-0335	ART 7.2	*LSI A1.6.2.1.1.4.3 Report Enemy Information	UAV 1					
0340-0835	ART 7.2	*MTP 17-5-0011.17-KCRW Establish and Maintain Communications	UAV 2	x0	x1			
0431-0436, 0715-0720	ART 7.2	*LSI A1.6.2.1.1.4.3 Report Enemy Information	UAV 2	x0	x1			
0543-1000	ART 7.2	*MTP 17-5-0011.17-KCRW Establish and Maintain Communications	UAV 3	x0	x1			

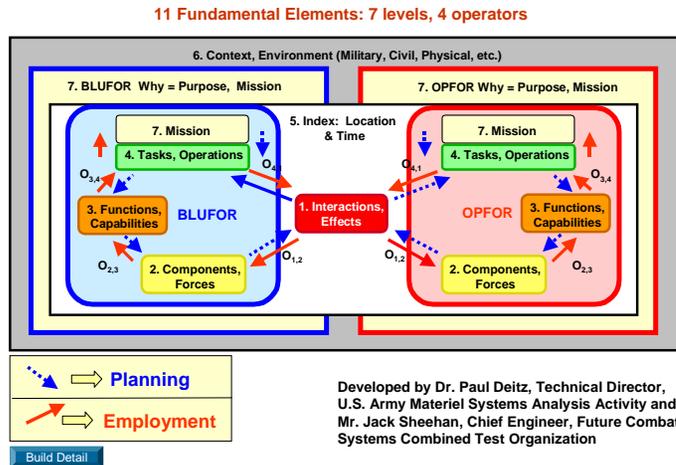


MMF Formal Process Diagram



Outline

Missions and Means Framework Model



- Introduction
- Background/MMF Review
- Using MMF to get to the “So What”
- Practical application – How MMF can be applied to ask the right questions and organize the resulting information.
- A few examples of MMF application to T&E
- Conclusion/Summary

MMF T&E Example

TJE Brief

FCS CTO

(PLACEHOLDER)

Level 3 Required Capabilities to Train-JCAS_JCID

Battlespace Awareness.

- 4 Provide for the development, maintenance and dissemination of Common Operating Picture (COP) %
- 5 Integrate LVC data into the Common Operational Picture (COP)
- 6 Provide for ability to view and collect data from the Common Operational Picture (COP)#, %
- 7 Develop and Maintain Battle Space Awareness via Common Operating Picture (COP)
- 8 Ensure key C2 nodes such as JFACC, JFLCC, CAOC, ASOC, TACC, DASC have adequate communications systems (including secure comms) #
- 9 Integrate range COP and data collection
- 10 Provide for target location at all levels of visibility%
- 11 Provide for target designation at all levels of visibility%
- 12 Provide for collaborative mission planning%
- 13 Provide for collaborative mission rehearsal
- 14 Provide for positive target identification at all levels of visibility
- 15 Provide training situations for practice of Battle Damage Assessment (BDA) and integration of BDA with other data for overall combat
- 16 Ensure timely coordination and integration of Battle Damage Assessment (BDA) reports from aircrew and venue generated sources#
- 17 Provide for JCAS Battle Damage Assessment (BDA)
- 18 Provide virtual and constructive training to improve battlefield situational awareness of entities (friend, foe, neutral or other non-combatant) in the tactical battlespace and target location data, including updating vehicles and other entities with correct signatures

Sample list

Command and Control.

- 22 Mandate and facilitate the use of automated systems for C2 by BCT's (I.e.Command and Control Personal Computer (C2PC) or Force Battle Command Battalion/Brigade and Below (FBCB2)#)
- 23 Mandate exercise planning takes into account peacetime training constraints (location restrictions, airspace, weapons availability,availability of C4I systems, etc) to minimize the impact on training.#
- 24 Provide or establish Joint Force command and control (C2) structure for events
- 25 Provide training in forward area Command and Control (C²) of aircraft
- 26 Ensure ATO and SPINS concur for C4 capabilities#
- 27 Mandate and facilitate C2 and equipment requirements are addressed for training and observer monitoring:#
- 28 Provide complete air picture at command nodes (CAOC)#
- 29 Provide for Joint Close Air Support (JCAS) Command & Control (C2) needed to synchronize JCAS and ground maneuver
- 30 Facilitate training in coordinating airspace for UAV support#,%
- 31 Provide for constructive command nodes to provide all appropriate orders and instructions (comm plan, ATO, SPINS, etc.)#
- 32 Require exercise communications architecture replicate real world operational architecture#
- 33 Provide for information exchange via interoperable communications (visual / voice / digital)%
- 34 Enable Have Quick Interoperability#
- 35 Mandate Commander development of Annex K for Op Order#
- 36 Provide ability for OC's to access key communications and coordination nodes#,%
- 37 Provide for communications between range sites; CAOC-N and NTC air assets, Battlefield Coordination Detachment (BCD) #
- 38 Mandate, facilitate and Provide for the use of Joint Data Network (JDN) IAW doctrine and TTP#
- 39 Facilitate training in Airspace Coordination Area activation and deactivation between Division Tactical Operations Center (DTOC), BCT, and Direct Support artillery battalion TOCs#,%
- 40 Provide for real-time information exchange via interoperable communications (visual / voice / digital)
- 41 Establish Joint training strategy

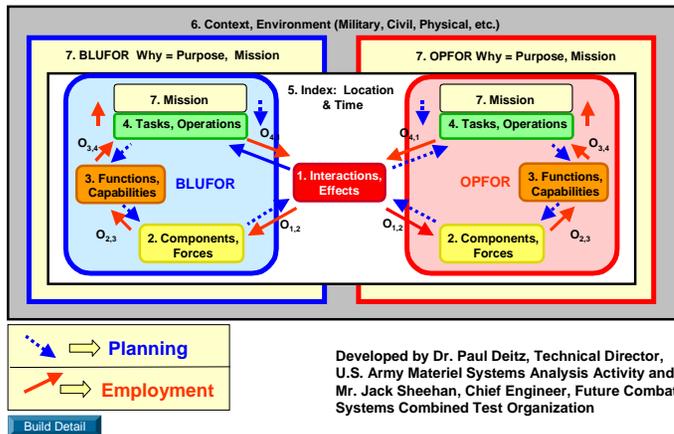
	A	B	C	D	E	F	G
	WRC Facilities	NTC, Ft Irwin, CA	Nellis AFB, NV	MCAGCC, 29 Palms, CA	Naval Station San Diego, CA	VSMR, NM	NAS Fallon, NV
1	Level 3 Required Capabilities to Train						
2	Battlespace Awareness.						
3							
4	Provide for the development, maintenance and dissemination of Common Operating Picture (COP) %	4	4	8	4	4	4
5	Integrate LVC data into the Common Operational Picture (COP)	4	4	8	4	4	4
6	Provide for ability to view and collect data from the Common Operational Picture (COP)#, %	4	4	8	1	4	1
7	Develop and Maintain Battle Space Awareness via Common Operating Picture (COP)	4	4	8	1	4	1
8	Ensure key C2 nodes such as JFACC, JFLCC, CAOC, ASOC, TACC, DASC have adequate communications systems (including secure comms) #	4	0	8	1	0	8
9	Integrate range COP and data collection	4	4	8	1	4	1
10	Provide for target location at all levels of visibility%	4	4	8	4	4	4
11	Provide for target designation at all levels of visibility%	4	4	8	4	4	4
12	Provide for collaborative mission planning%	4	4	8	4	4	4
13	Provide for collaborative mission rehearsal	4	4	8	4	4	4
14	Provide for positive target identification at all levels of visibility	4	4	8	1	1	1
15	Provide training situations for practice of Battle Damage Assessment (BDA) and integration of BDA with other data for overall combat assessment			1	4	1	4
16	Ensure timely coordination and integration of Battle Damage Assessment (BDA) reports from aircrew and venue generated sources#		4	4	4	4	4
17	Provide for JCAS Battle Damage Assessment (BDA)		1	4	4	1	4
18	Provide virtual and constructive training to improve battlefield situational awareness of entities (friend, foe, combatant) in the tactical battlespace and target location data, including updating vehicles and other entities signatures	4	8	8	8	8	8
19							
20	Command and Control.						
21							
22	Mandate and facilitate the use of automated systems for C2 by BCT's (i.e. Command and Control Personal Computer (C2PC) or Force Battle Command Battalion/Brigade and Below (FBCB2))#	4	0	8	8	4	0
23	Mandate exercise planning takes into account peacetime training constraints (location restrictions, airspace, weapons availability, availability of C4I systems, etc) to minimize the impact on training.#	4	4	4	4	4	4
24	Provide or establish Joint Force command and control (C2) structure for events	4	4	4	4	4	4
25	Provide training in forward area Command and Control (C ²) of aircraft	4	4	1	1	4	1
26	Ensure ATO and SPINS concur for C4 capabilities#	4	4	4	4	4	4
27	Mandate and facilitate C2 and equipment requirements are addressed for training and observer monitoring:#	4	1	1	1	1	1
28	Provide complete air picture at command nodes (CAOC)#	4	4	4	4	4	4
29	Provide for Joint Close Air Support (JCAS) Command & Control (C2) needed to synchronize JCAS and ground maneuver	4	1	1	1	1	1
30	Facilitate training in coordinating airspace for UAV support#,%	4	1	8	1	1	1
31	Provide for constructive command nodes to provide all appropriate orders and instructions (comm plan, ATO, SPINS, etc.)#	4	4	4	4	4	4
32	Require exercise communications architecture replicate real world operational architecture#	4	7	4	7	1	7
33	Provide for information exchange via interoperable communications (visual / voice / digital)%	4	7	4	4	1	4
34	Enable Have Quick Interoperability#	8	1	8	8	8	1
35	Mandate Commander development of Annex K for Op Order#	4	1	1	1	1	1
36	Provide ability for OC's to access key communications and coordination nodes#,%	4	8	8	1	8	8
37	Provide for communications between range sites; CAOC-N and NTC air assets, Battlefield Coordination Detachment (BCD) #	4	7	8	1	1	4
38	Mandate, facilitate and Provide for the use of Joint Data Network (JDN) IAW doctrine and TTP#	8	1	8	8	1	8
39	Facilitate training in Airspace Coordination Area activation and deactivation between Division Tactical Operations Center (DTOC) BCT and Direct Support artillery battalion TOCs#,%	4	8	8	8	4	8

NOTIONAL VALUES

Outline

Missions and Means Framework Model

11 Fundamental Elements: 7 levels, 4 operators



- Introduction
- Background/MMF Review
- Using MMF to get to the “So What”
- Practical application – How MMF can be applied to ask the right questions and organize the resulting information.
- A few examples of MMF application to T&E
- **Conclusion/Summary**

Conclusion/Summary

- Top – Down driven Mission to Task Decomposition
Process necessary to identify tasks required to accomplish the Mission – Important to determining ESS.
- Military Professionals use doctrinal processes to analyze Missions, plan Operations and monitor and assess progress towards accomplishing Mission during execution.
- The MMF provides a disciplined and structured framework that translates these doctrinal processes into a detailed data set that enables a common framework of understanding between stakeholder communities

Missions and Means Framework

11 Fundamental Elements:

Seven Levels, Four Operators

7. OWNFOR Why = Purpose, Mission

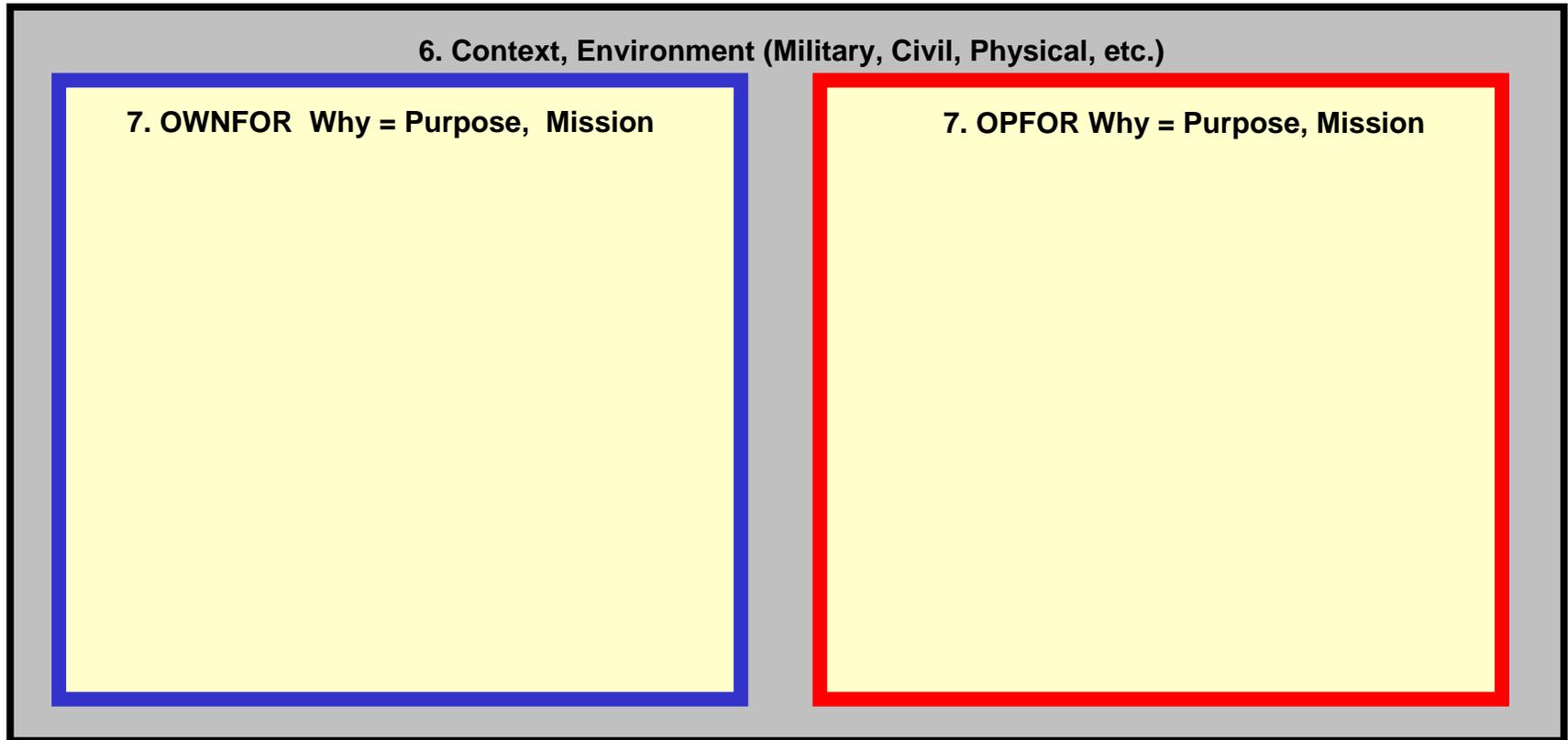
7. OPFOR Why = Purpose, Mission

7. Why, Wherefore, to What End

Missions and Means Framework

11 Fundamental Elements:

Seven Levels, Four Operators

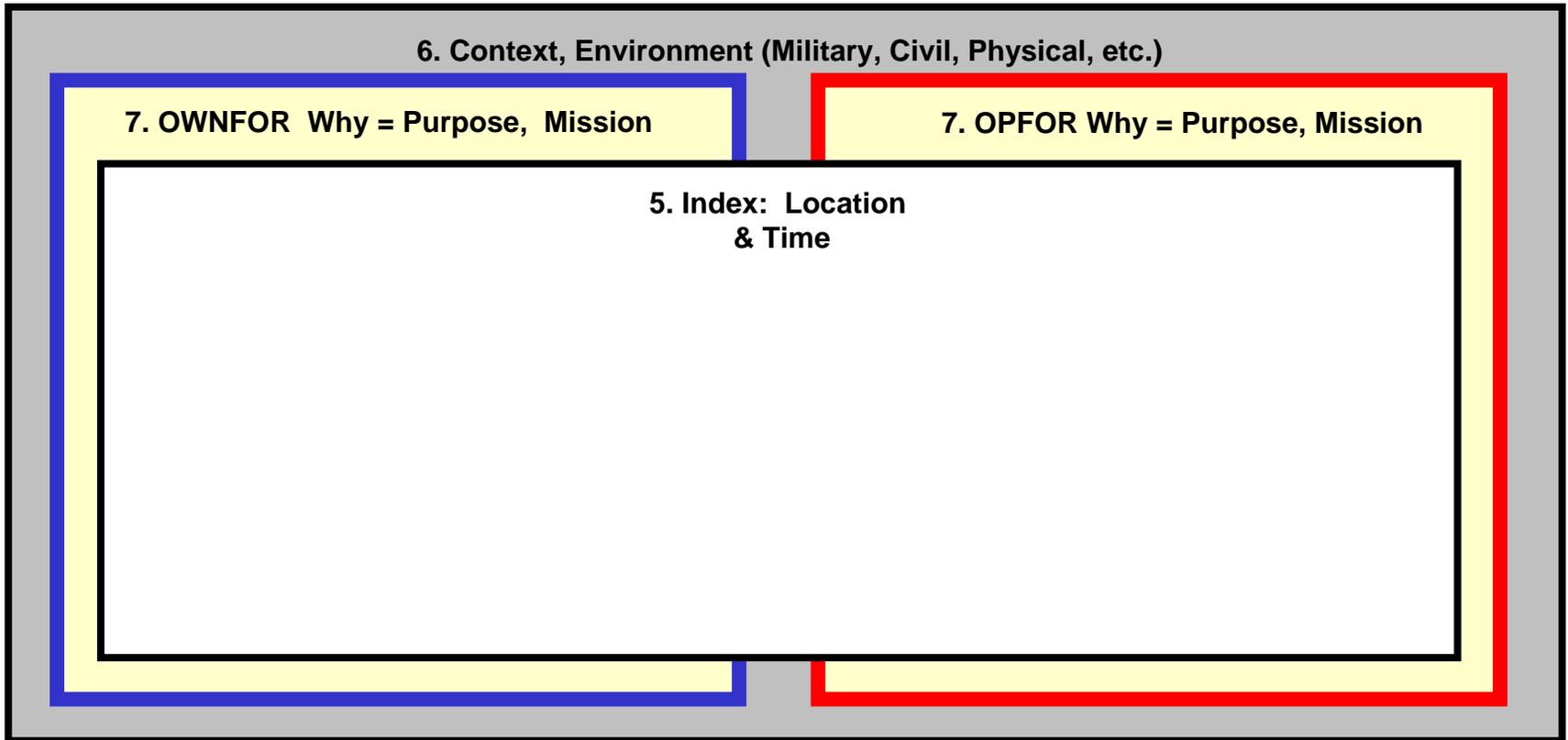


6. Under What Circumstances

Missions and Means Framework

11 Fundamental Elements:

Seven Levels, Four Operators

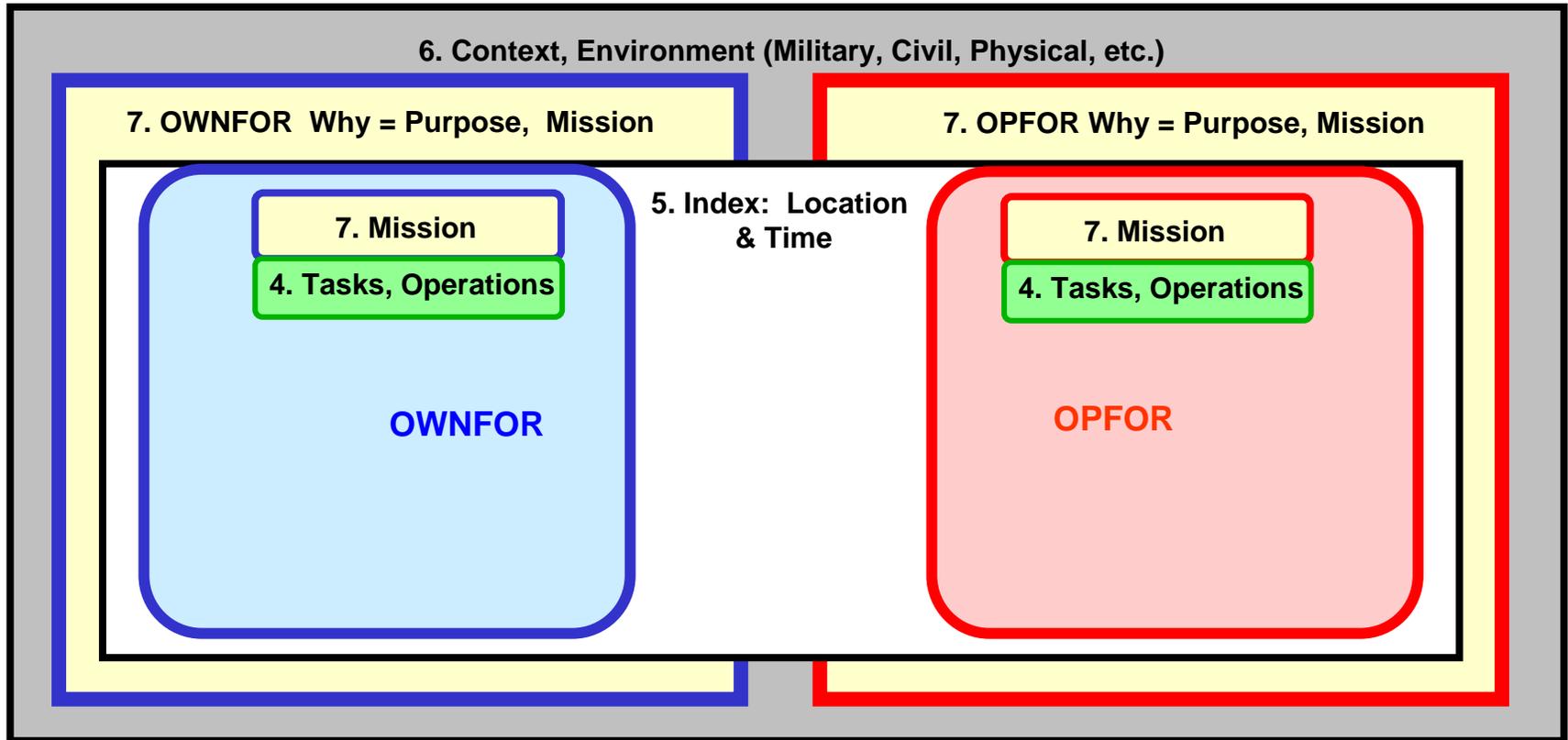


5. When and Where

Missions and Means Framework

11 Fundamental Elements:

Seven Levels, Four Operators

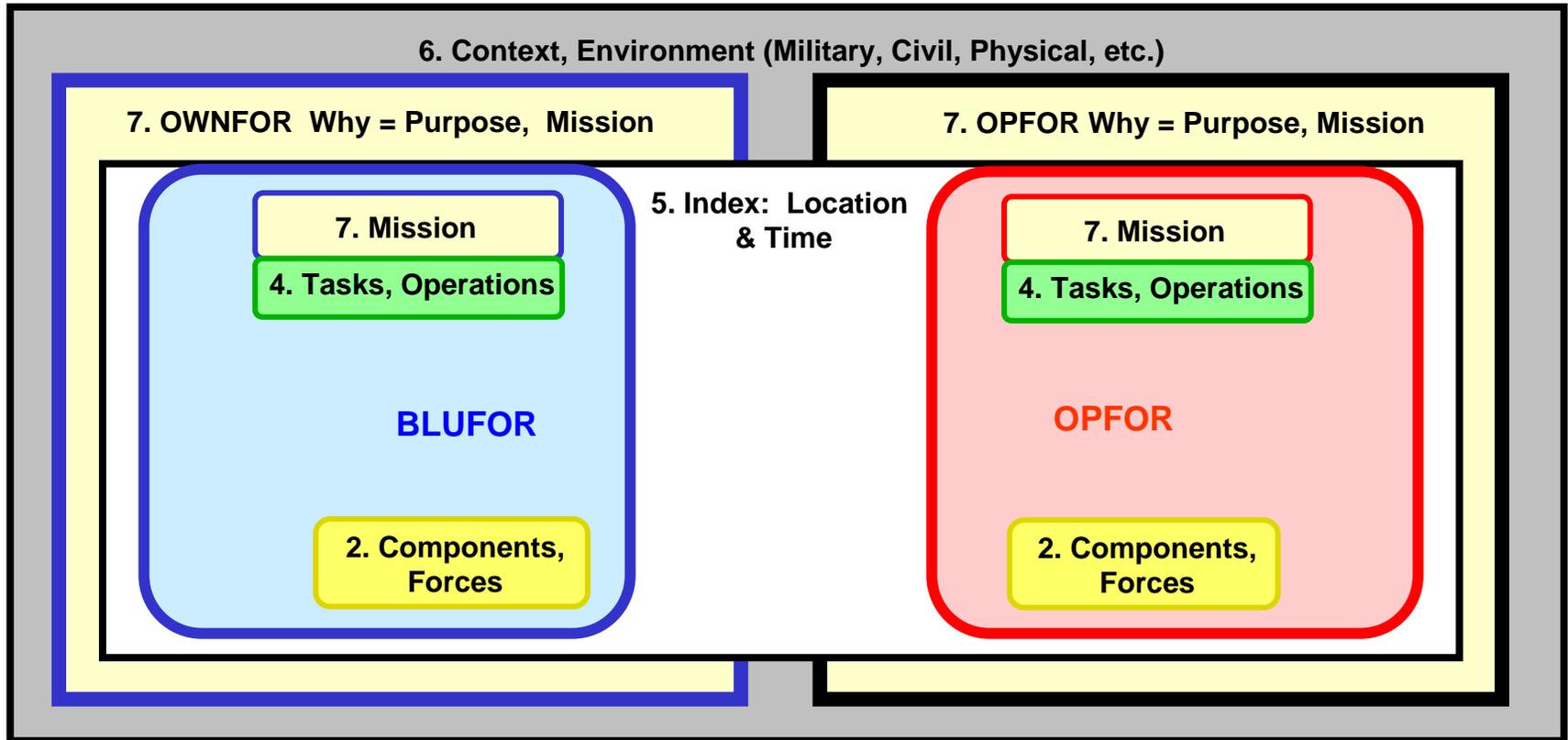


4. Activity-centric, named with a Verb, “Do What” -- the Playbook

Missions and Means Framework

11 Fundamental Elements:

Seven Levels, Four Operators

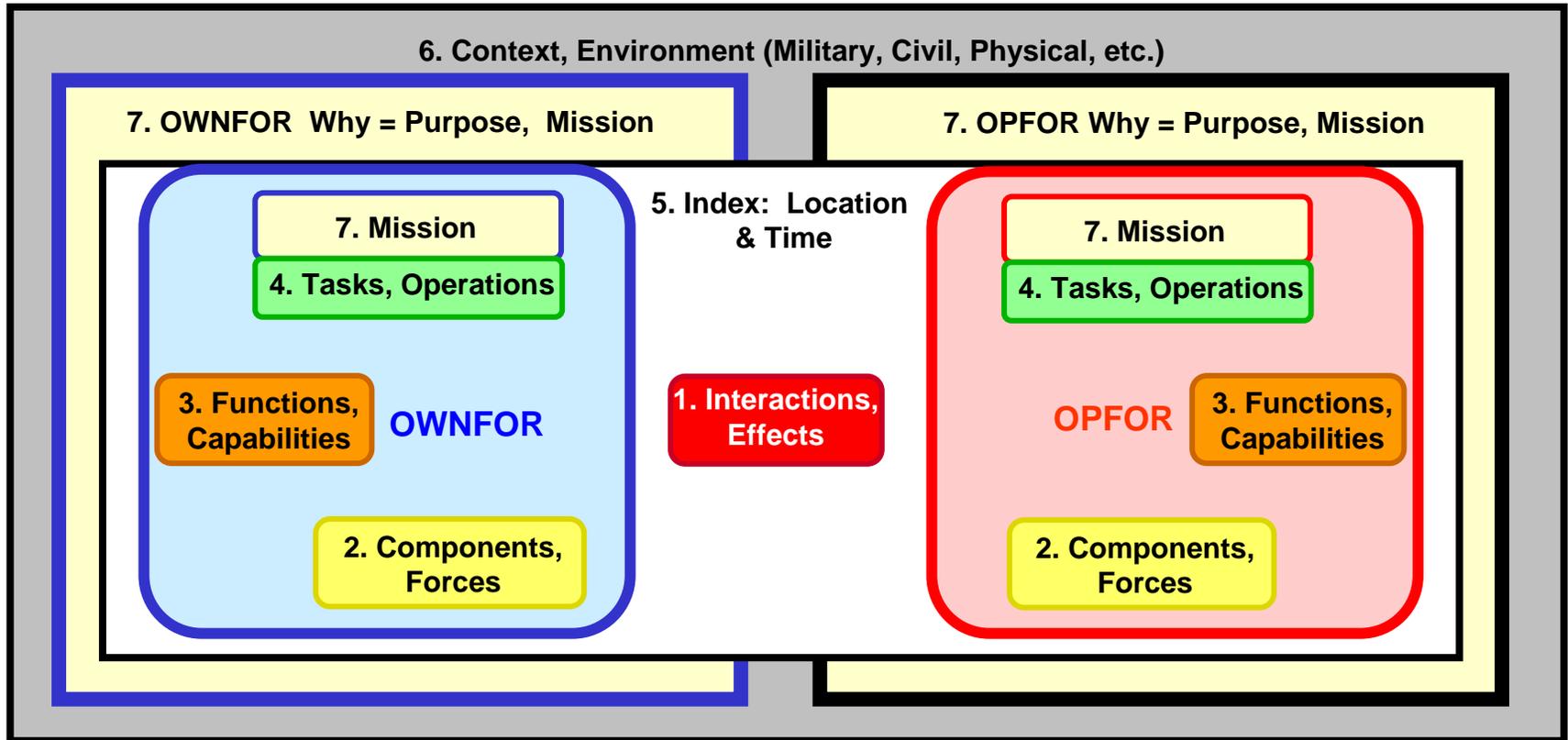


2. Entity-centric, named with a Noun “By Whom” -- the Players

Missions and Means Framework

11 Fundamental Elements:

Seven Levels, Four Operators

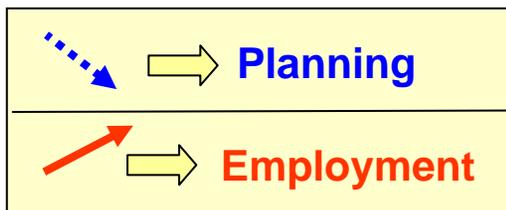
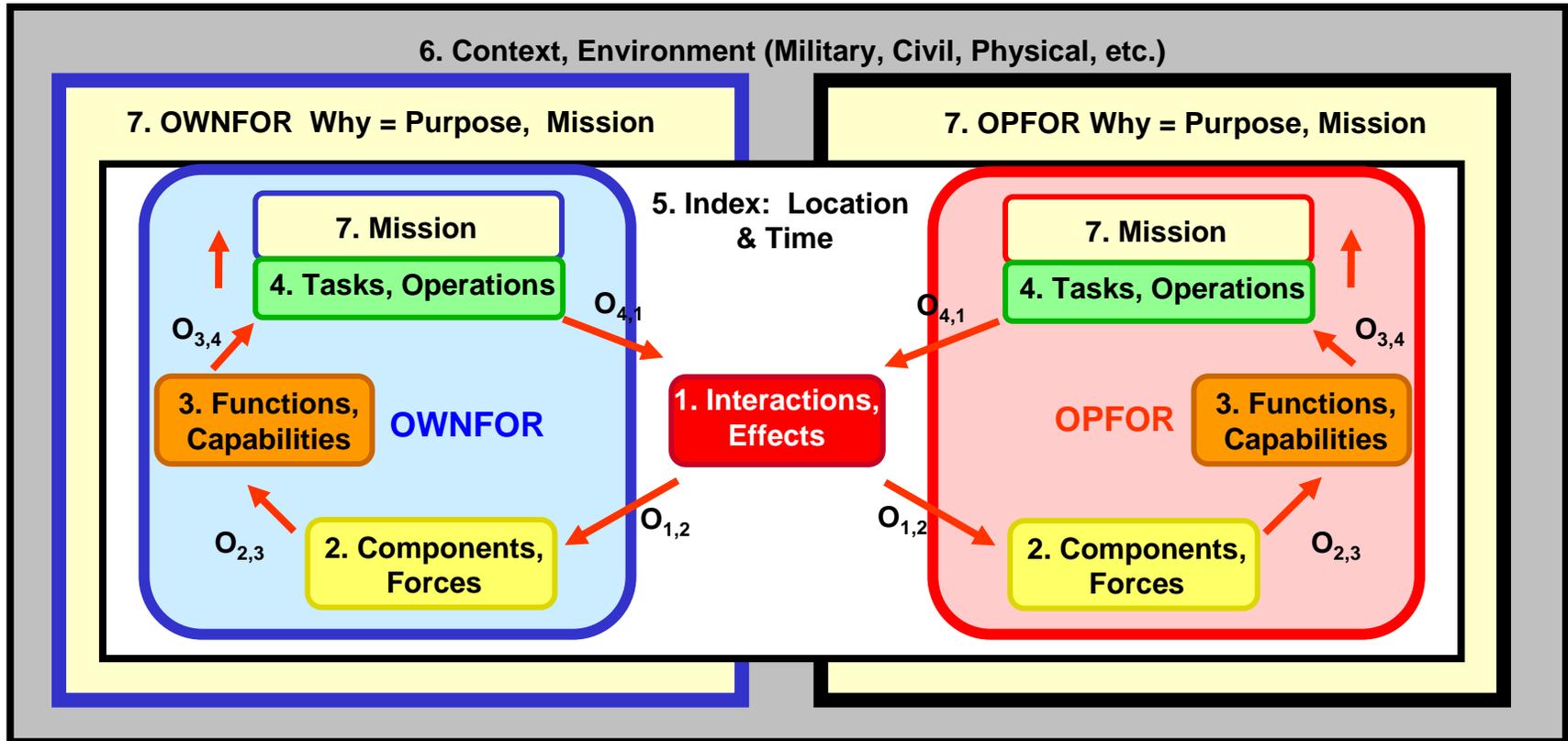


1. The (shared) Slings-and-Arrows of Outrageous Fortune -- Science
3. Condition-dependent “How Well” -- Engineering

Missions and Means Framework

11 Fundamental Elements:

Seven Levels, Four Operators

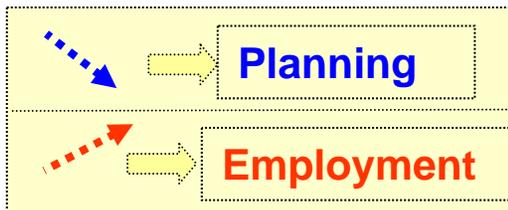
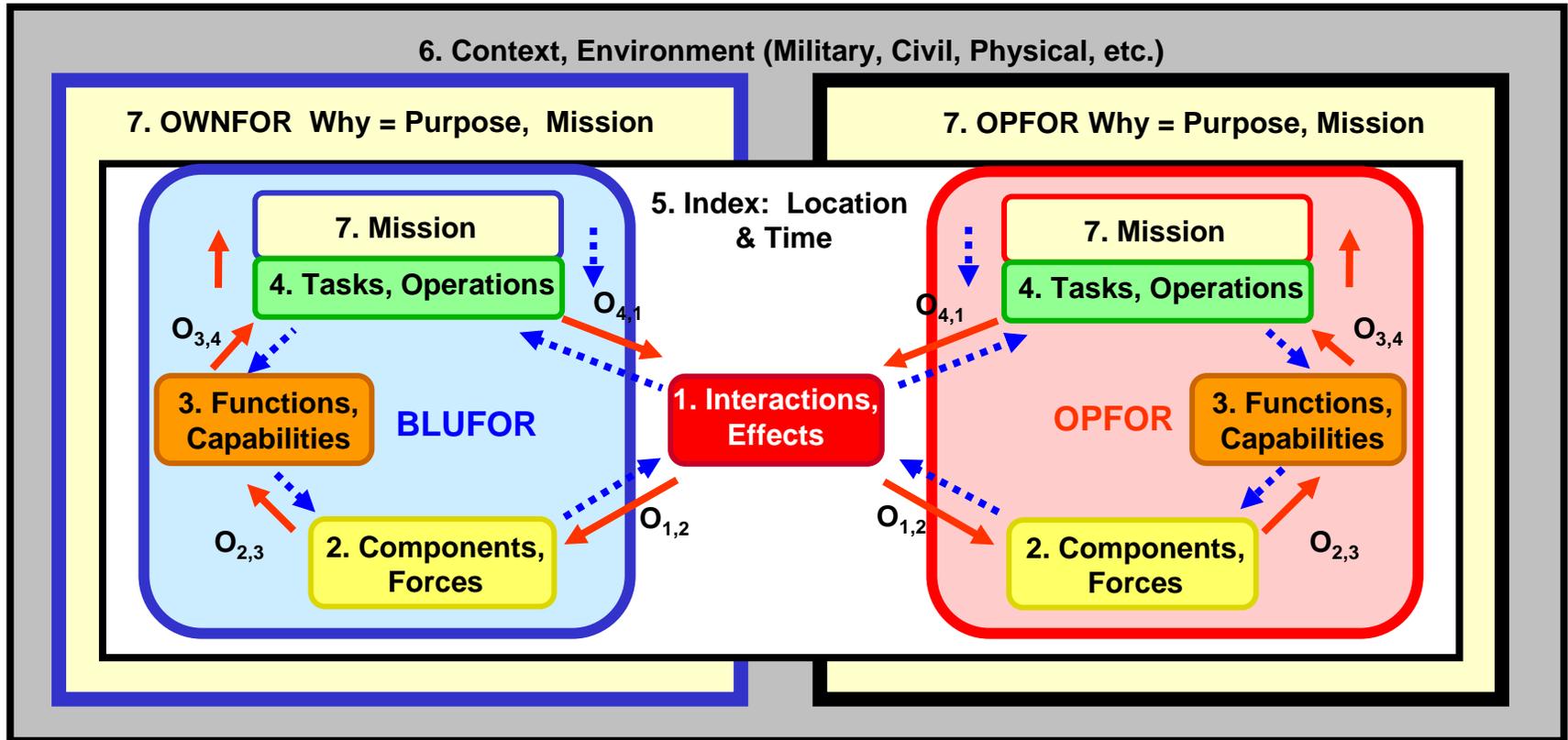


Bottom-up, Causal, Time-forward execution and adjudication of outcomes

Missions and Means Framework

11 Fundamental Elements:

Seven Levels, Four Operators

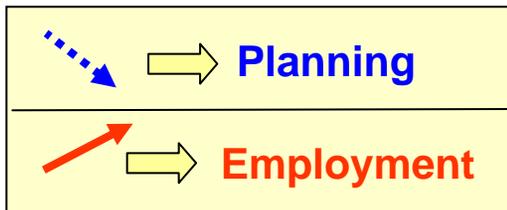
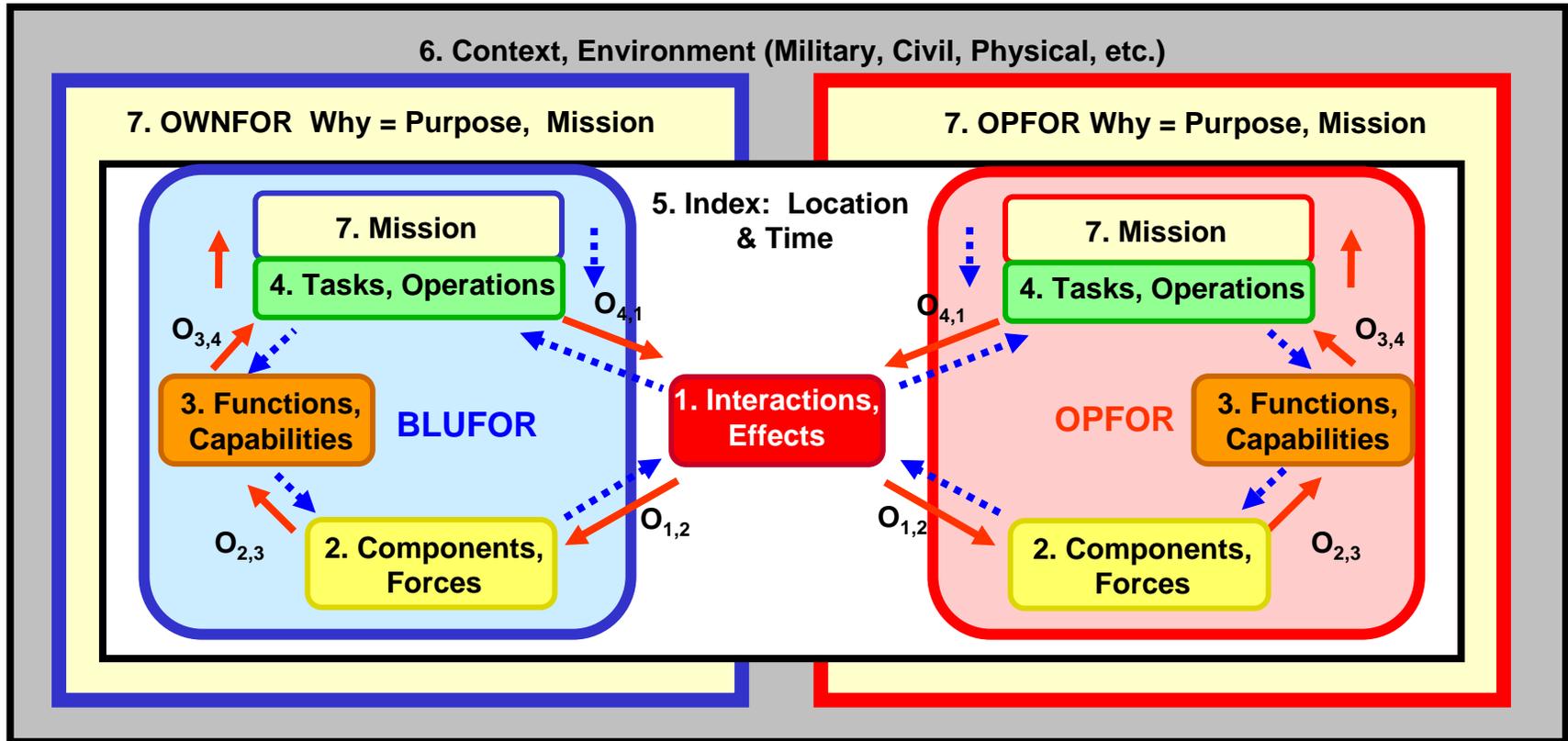


**Top-Down, Concurrent
Synthesis and Decision Making**

Missions and Means Framework

11 Fundamental Elements:

Seven Levels, Four Operators



Return

**Architecture defines how Parts
are assembled into Packages**