



THE COMMAND AND CONTROL RESEARCH PROGRAM



14th International Command and Control Research and Technology Symposium

June 15-17, 2009

Command and Control (C2) Ontology (Paper 159)

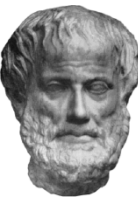
Barry Smith, Ph.D.

LTC Kristo Miettinen

MAJ Bill Mandrick, Ph.D.



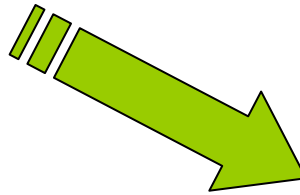
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Begin with the Low-Hanging Fruit

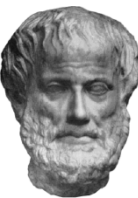
- Getting to the Low-Hanging Fruit
 - Reliable Data Sources
 - Good C2 Models
 - C2 Experience
 - Apply 10/90 rule
 - Use “Best Practices”



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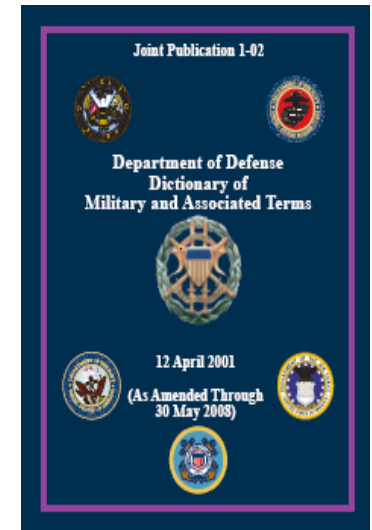
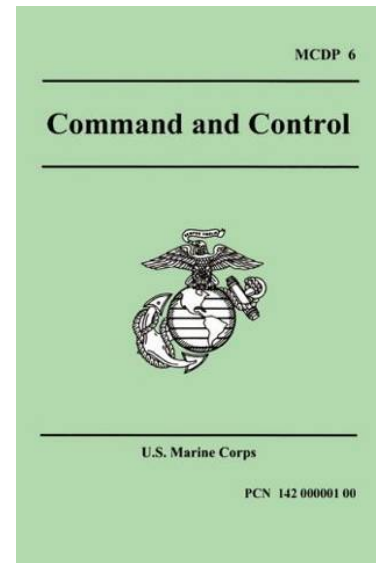
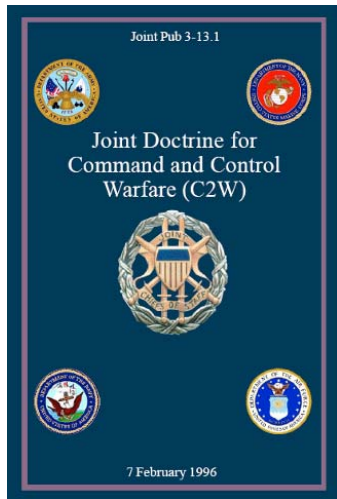
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Some Sources...

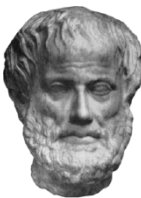
- JP 5-0 Joint Operation Planning
- JP 1-02 DoD Dictionary of Military and Related Terms
- JP 3-13.1 Joint Doctrine for Command and Control
- JP 3-0 Joint Operations
- FM 3-0 Operations



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The Elements of C2

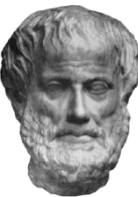
- **C2 consists of:**
 - Force Structure, Integration, Organization
 - Operational Functions and Tasks
 - Situational Awareness
 - Planning and Analysis
 - Decision Making and Direction
 - Monitoring Progress (Assessing)
- **C2 terminology will result from these elements**
- **Lets consider them individually...**



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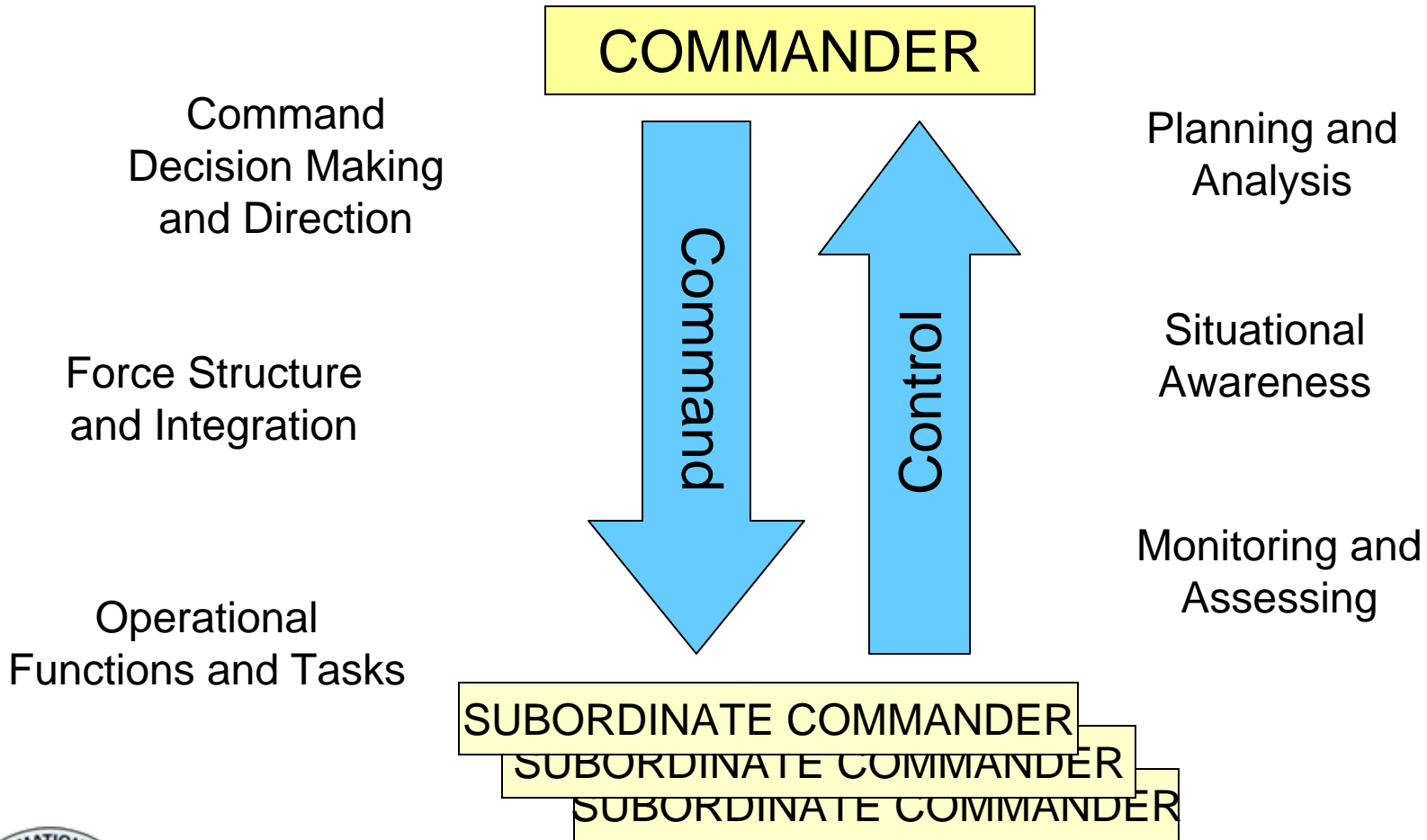
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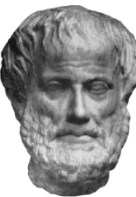
USMC Command and Control Model



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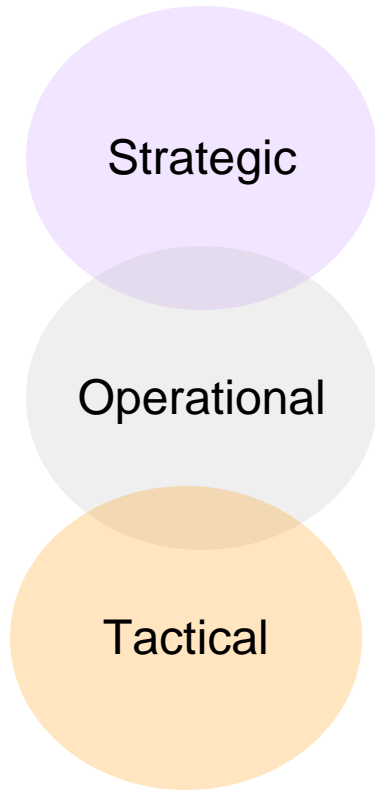
Source: USMC Doctrinal
Publication 6
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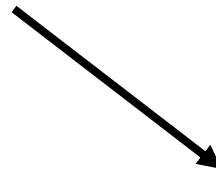




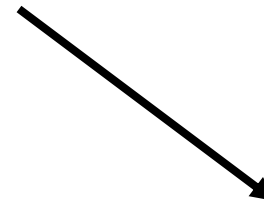
Top Down, Bottom Up



Devising Strategy



Operational Planning and Decision Making



Tactical Messaging

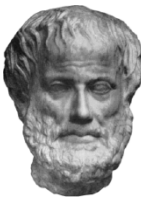
Call For Fire, MEDEVAC, SITREPS...



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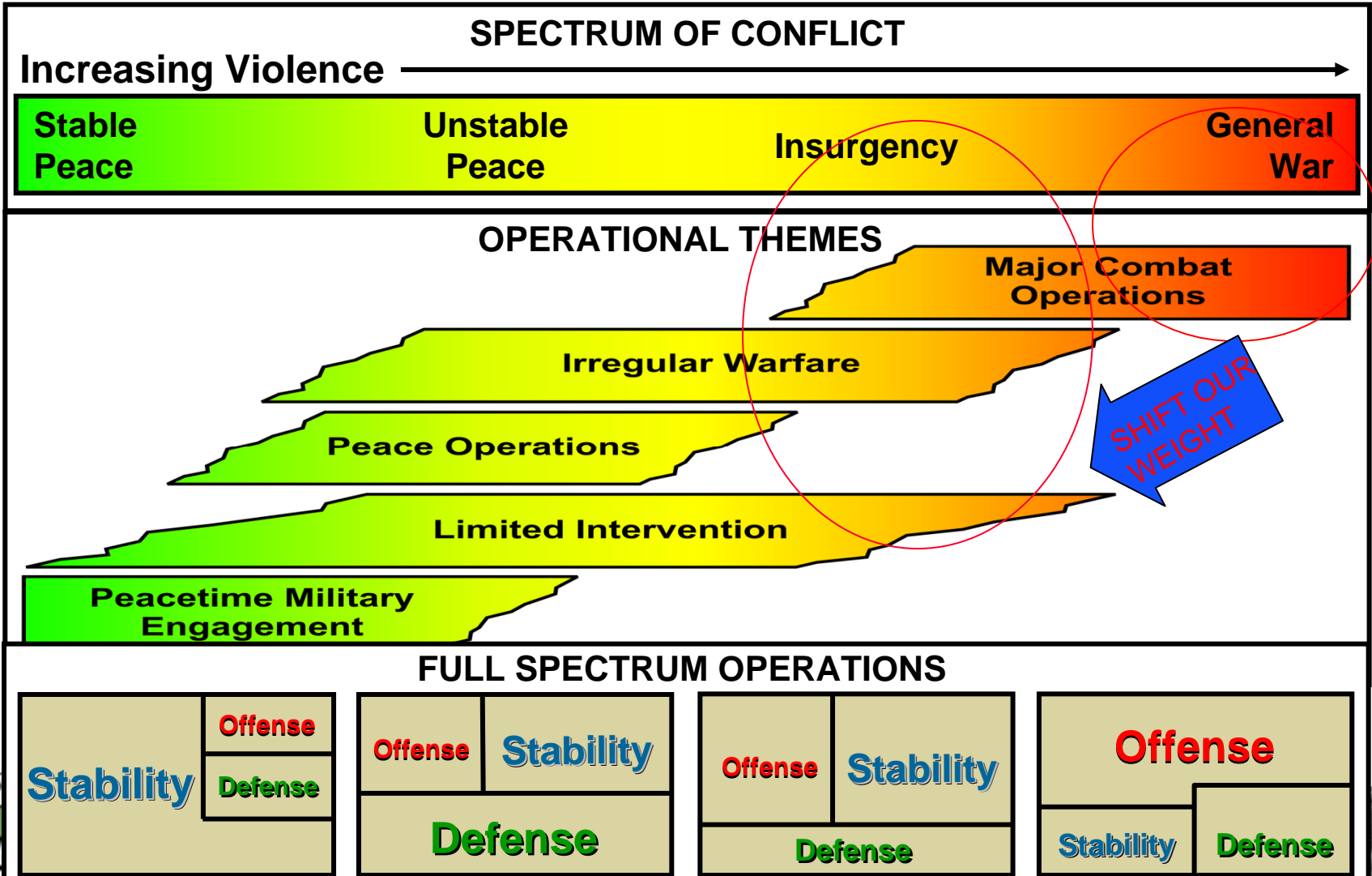
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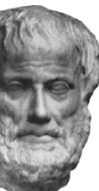
FM 3-0, Army Full Spectrum Operations



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Force Structure, Integration, Organization



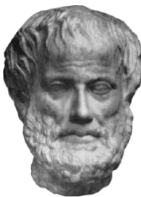
UCore-SL	C2 Extension
Act	ActOfOrganizing
Organization	Civil Organization
Organization	Criminal Organization
Organization	Governmental Organization
Organization	Humanitarian Organization
Organization	Military Organization



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Operational Functions (Tasks)



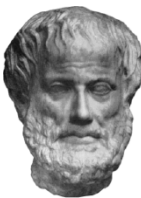
UCore-SL	C2 Extension
Military Event	Battle
Military Event	Campaign
Military Event	Engagement
Task	Essential Task
Task	Mission
Military Event	Operation



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Situational Awareness



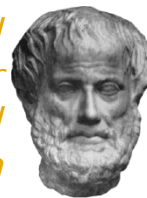
UCore-SL	C2 Extension
Act	Act of Analysis
Geospatial Region	Area of Influence
Geospatial Region	Area of Interest
Geospatial Region	Area of Operations
Control Feature	Boundary
Objective Specification	Criminal Objective Specification
Objective Specification	Governmental Objective Specification
Information Content Entity	Message
Geopolitical Entity	Population Center
Information Content Entity	Report



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Planning and Analysis



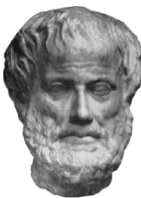
UCore-SL	C2 Extension
Act	Act of Plan Creation
Act	Act of Plan Revision
Plan	Battle Plan
Plan	Campaign Plan
Objective	Criminal Objective
Objective	End State
Objective	Governmental Objective
Objective	Military Objective
Objective Specification	Military Objective Specification
Plan	Operation Plan



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Decision Making and Direction



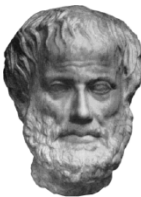
UCore-SL	C2 Extension
Act of Communication	Act of Order Issuance
Document	Battle Plan Document
Document	Campaign Plan Document
Task Specification	Fragmentary Order
Information Content Entity	Guidance
Task Specification	Operation Order
Document	Operation Plan Document
Task Specification	Warning Order
Document	Warning Order Document



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Monitoring Progress



UCore-SL	C2 Extension
Act	Act of Assessment
	Effect
	Measure of Effectiveness
Control Feature	Phase Line
Geospatial Region	Sector
Information Content Entity	Situation Report
Control Feature	Target



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Tactical Level Messages

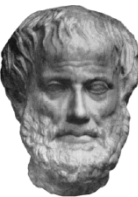
UCore-SL	C2 Core	Message
Objective: An Information content entity that represents the content of an objective specification	Mission: an Objective of a military Plan.	Fire Mission: a mission given to a fire unit as part of a definite plan.
Geospatial Region: a physical entity that is a spatial region at or near the surface of the Earth	Location: A geospatial region that is denoted by a geospatial measurement datum.	Target Location: A Location occupied by an entity at a given time that is denoted by the measurement output of some targeting event.
Geospatial Region: a physical entity that is a spatial region at or near the surface of the Earth	Location: A geospatial region that is denoted by a geospatial measurement datum.	Facility Location: A Location occupied by an entity at a given time that is denoted by the measurement output of some mapping event.



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Tactical Level Messages

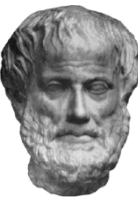
UCore-SL	C2 Core	Message
Information Content Entity: An Entity which consists of information and which inheres in some physical entity (i.e. an information bearing entity)	Identifier: An information content entity that denotes a specific entity instance.	Target Identifier Abstract: An identifier that denotes the target of some targeting event.
Information Content Entity: An Entity which consists of information and which inheres in some physical entity (i.e. an information bearing entity)	Identifier: An information content entity that denotes a specific entity instance.	Warhead Identifier: An identifier that denotes a warhead.



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Other Doctrinal C2 Terms...

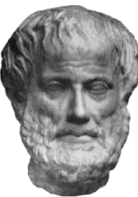
- **Commander's Intent**
- **Purpose**
- **Tactical Problem**
- **Operational Environment**
- **Act of Visualization**
- **Common Operating Picture**
- **Operational Design**
- **Element of Combat Power**
- **Effect**
- **Commander's Guidance**
- **War-fighting Function**
- **Priority Information Requirement (PIR)**
- **Decision Point**
- **Marine Corps Planning Process (MCP)**
- **Military Decision Making Process**



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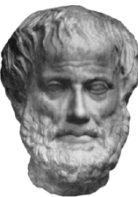
Backup Slides



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Sample Terms

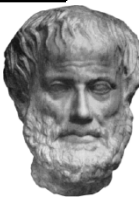
UCore-SL Term	C2 Extension Term
<p>Item of Materiel</p> <p>Equipment</p> <p>Vehicle</p> <p>Aircraft</p> <p>Replacement Part</p>	<p>Military Vehicle</p> <p>Military Aircraft</p> <p>Military Close-air-support Aircraft</p> <p>Civilian Aircraft</p> <p>Military Equipment Replacement Part</p>
<p>Military Event</p>	<p>Military Campaign</p> <p>An Operation is part of a Campaign</p> <p>A Battle is part of an Operation</p> <p>An Engagement is part of a Battle</p>
<p>Organization</p>	<p>Military Organization</p> <p>Governmental Organization</p> <p>Humanitarian Non-Governmental Organization</p> <p>Criminal Organization</p>



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Task and Purpose

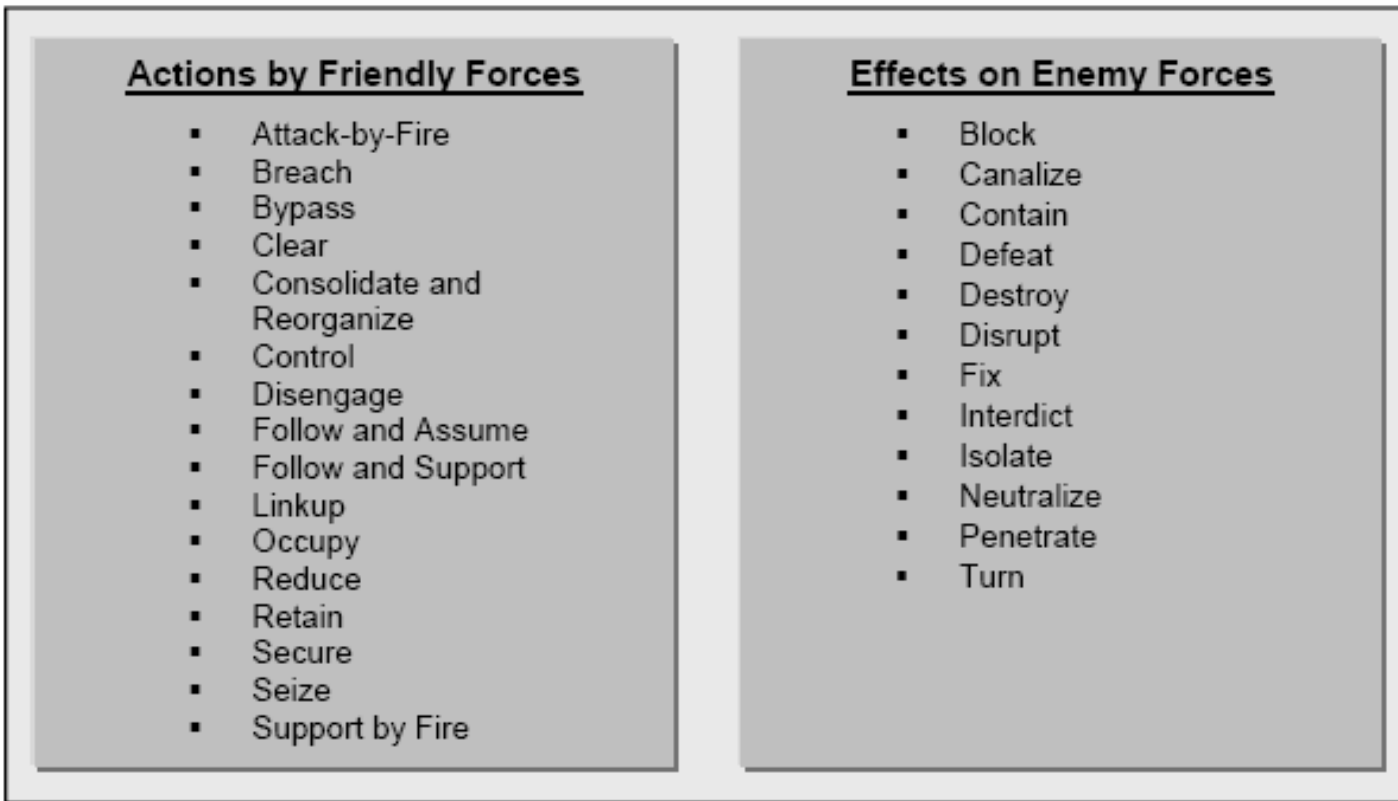


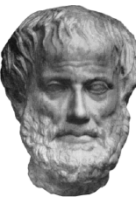
Figure 3-7. Mission Tasks



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Relations Ontology



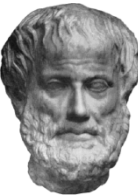
- *is_a*
- *Instantiates*
- *continuant_part_of*
- *occurrent_part_of*
- *region_part_of*
- *adjacent_to*
- *contained_in*
- *contains*
- *located_in*
- *overlaps*
- *has_participant*
- *has_agent*
- *specifically_inheres_in*
- *generically_inheres_in*
- *quality_of*
- *function_of*
- *role_of*
- *disposition_of*
- *realized_by*
- *towards*
- *derives_from*
- *transformation_of*
- *preceded_by*
- *lacks_part*



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Types of Military Operations (Previous Army)



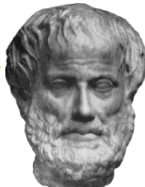
From: FM 3-90 Tactics



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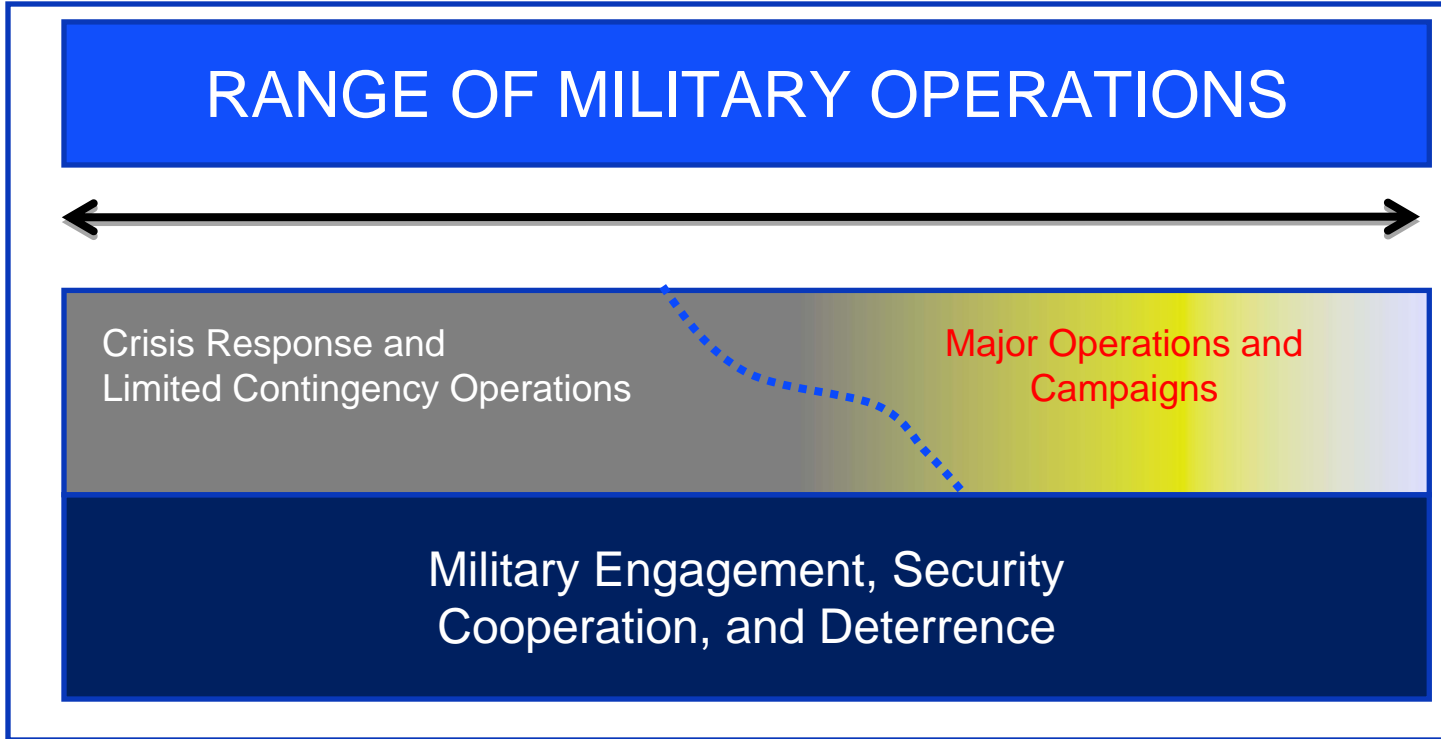
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Joint Military Operations



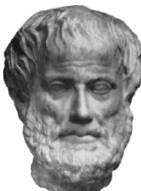
JP 3-0, Joint Operations



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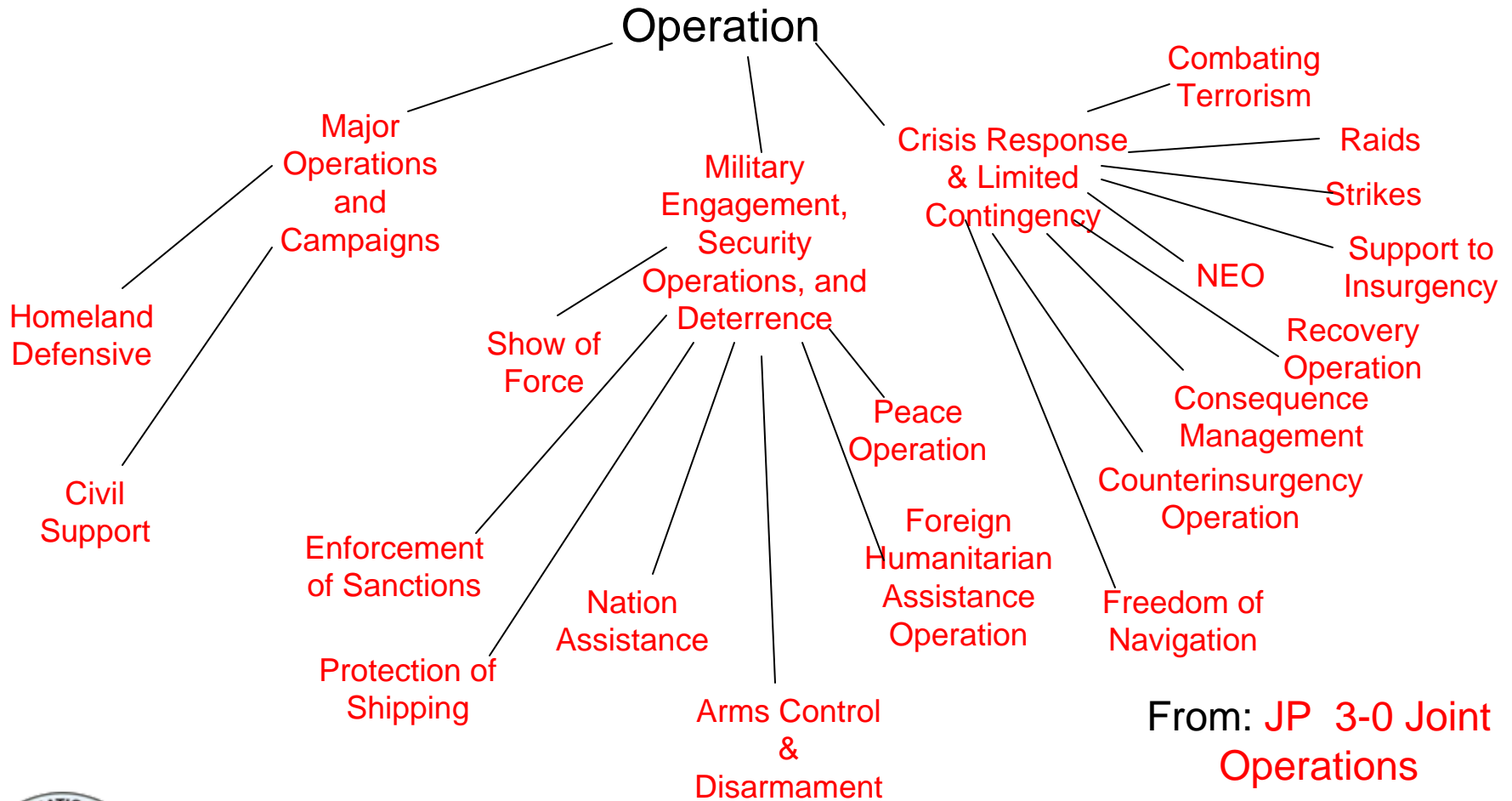
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Types of Military Operations (Joint)



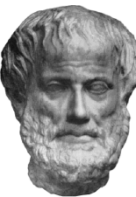
From: JP 3-0 Joint Operations



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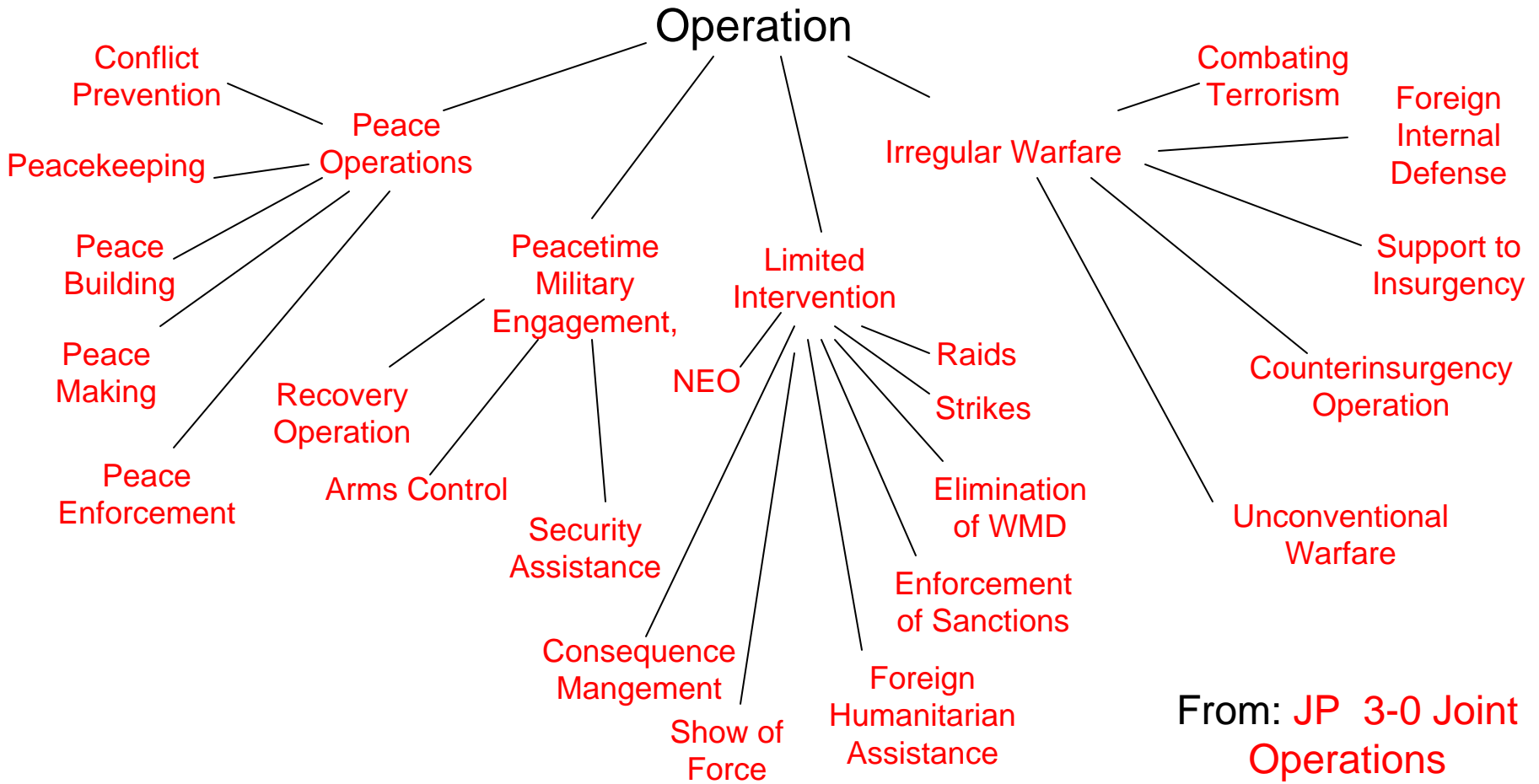
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Types of Military Operations (Army FM 3-0)



From: JP 3-0 Joint Operations



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