

# Linking Endstate and Effects

## Using Soft Systems Methodology to Perform EBO Mission Analysis

***PAPER # 202***

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# Bottom Line Up Front

- EBO requires methodology to better link tactical objectives with strategic outcomes
- Mission analysis process provides intellectual foundation for linkage during planning
- Soft Systems Methodology provides Qualitative EBO problem structuring approach to supplement and improve current planning process

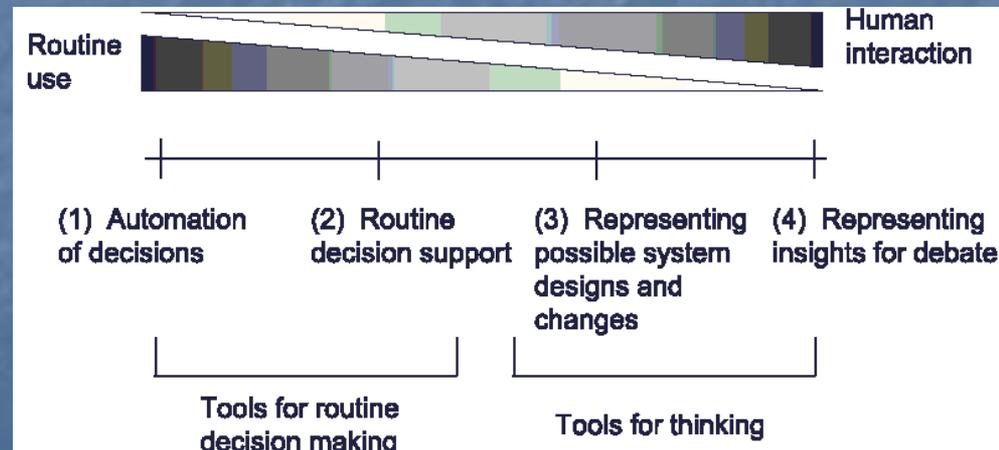
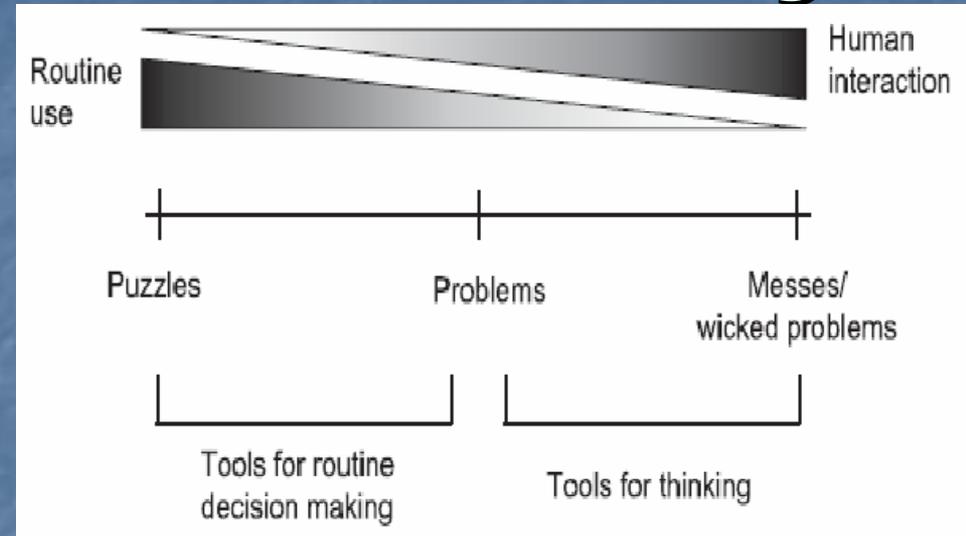
***“How you think about a problem is more important than the problem itself...” Norman Vincent Peale***

# Introduction

- EBO is the cornerstone of future US military employment
- Mission analysis *determines*:
  - Unified actions to achieve effects (E-N-A-R)
  - Effects necessary to achieve campaign objectives and tasks
- No official methodology to link effects to desired endstate (E-E-L)

# EBO Requires Problem Structuring

- Mess / Wicked Problem
  - What to do is not obvious
  - Complex / non-linear adversary
  - Friendly and environmental factors frustrate planning
- Defining “problem” problematic
  - Perspective, context, culture are critical
- Planning requires tools for thinking



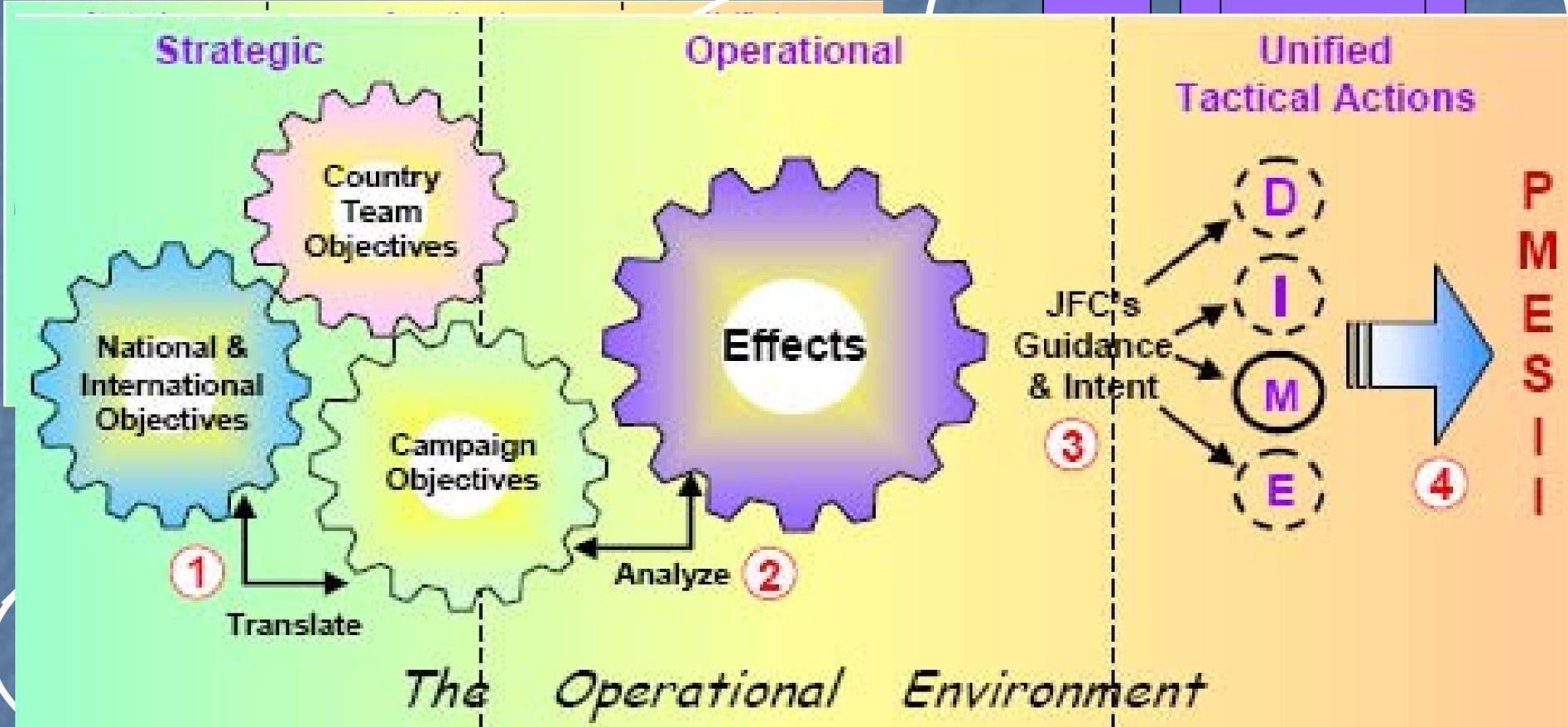
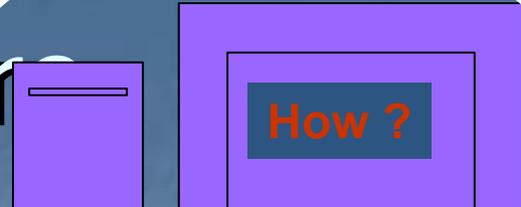
(Source: *Systems Modeling: Theory and Practice*. By Pidd )

# Soft Systems Methodology

- Conceived by Peter Checkland
  - 30-year old qualitative approach
- Overcome problems derived from traditional ops research approaches to human systems
  - Focuses on defining problematic system behavior and suggesting improvements
- Examine problematic behavior as a type of conceptual system (Human Activity System)

*Use SSM as a Front-end to Structure EBO Mission Analysis for Subsequent Solution-Oriented Efforts*

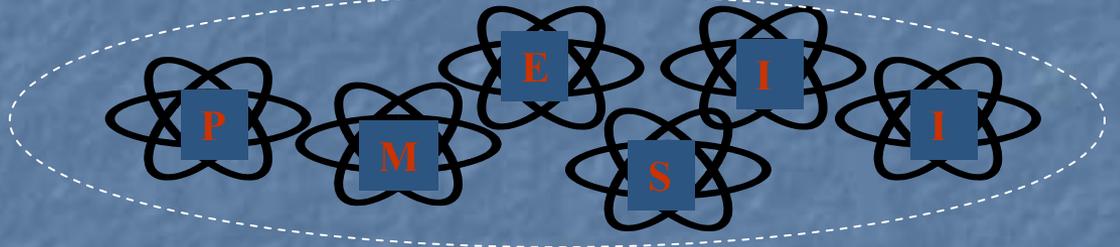
# The Big Picture



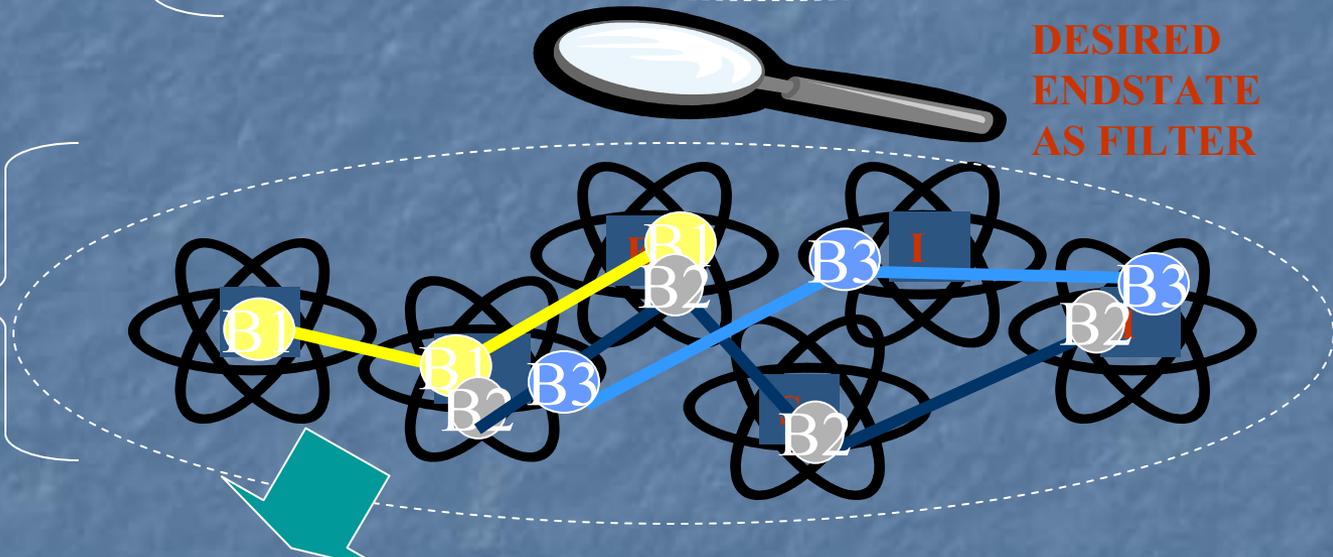
Source: "Why?"  
 "The Joint Warfighting Center Joint Doctrine Series Pamphlet 7"  
 by USJFCOM

# Complex Behavior as a System

ADVERSARY SYSTEM



ADVERSARY SYSTEM WITH PROBLEMATIC BEHAVIORS (B1-3) IDENTIFIED



BEH 1 =	P	M	E	ASPECTS = HAS 1	
BEH 2 =	M	E	S	I	ASPECTS = HAS 2
BEH 3 =	M	I	I	ASPECTS = HAS 3	

# SSM based EBO Mission Analysis

Endstate Objectives

Situation

Endstate & Objectives Filter and Orient relevant Data

S1

- Purpose: analyze endstate and context
- Purpose: Develop a "Rich Picture"
- Use of Endstate to accommodate various perspectives
- "Filter" to specify and sort contextual data
- Key elements

REAL WORLD ACTION

- Provides orientation
- Structure, processes, climate, look for emerging issues
- Iterative development
- Behaviors capture
- More encompassing

Rich Picture Captures and Accommodates Views on what's Going on

S2

Reframe through PMESII Lens

S3/4

Identify Behavior Inconsistent w/Endstate

S3/4

Examine Behavior as A Whole

Systems Thinking World Activities

Examine as Conceptual System

S3/4

S# = SSM Stage

Rich Picture Example

## Stage 3: Root Definitions – Identifying, Viewing and Reframing Behavior

- Purpose – Categorize Adversary Behavior, Express as a System
  - Lateral thinking exercise
  - Determine adversary behavior inconsistent with desired endstate
  - Identifies behavior to modify using EBO
- Develop a conceptual system (HAS) based on viewing the behavior as a system
  - Apply a PMESII perspective—same behavior can occur simultaneously in several systems
- SSM terminology specifies and structures problem
  - Root Definition, CATWOE Elements

# Stage 4: Conceptual Models – System Diagrams

- Represent idealized systems graphically
- Developed from Root Definitions
- Key is model consistency
  - Conform to General System Theory requirements for a logical system
- Iterative process
- Base on active language to build baseline for future EBO actions

# Reframing

- Attribution and description of problematic adversary system behavior can be understood within various systems depending on perspective
  - Successful EBO (system changes) must account for the most relevant perspectives
- “Reframing” develops awareness and understanding in complex environments
- EDI Matrix forces planners to consider multiple perspectives during planning
  - Goal – represent every problematic behavior with at least one conceptual system from each EDI quadrant

# EDI Matrix and Reframing

	HIGH DESIRABILITY	LOW DESIRABILITY
HIGH EXPECTANCY	Situation expected to be like the model and the model is desirable in the context. (I)	Situation expected to be like the model but the model is undesirable. (II)
LOW EXPECTANCY	Situation not like model but model is desirable (IV)	Situation not like model and model is undesirable. (III)

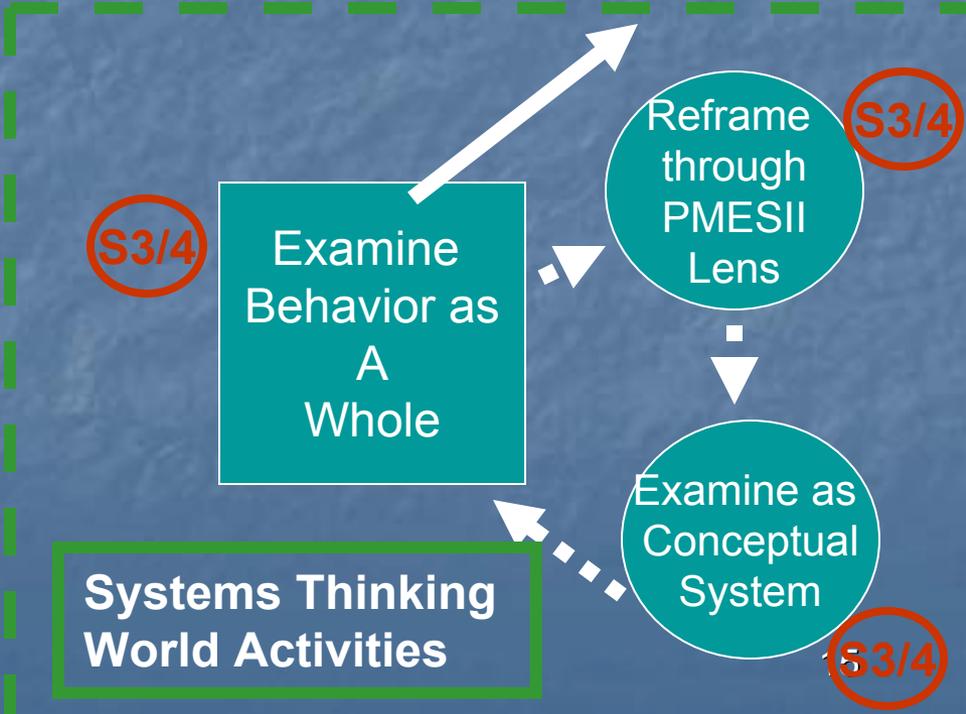
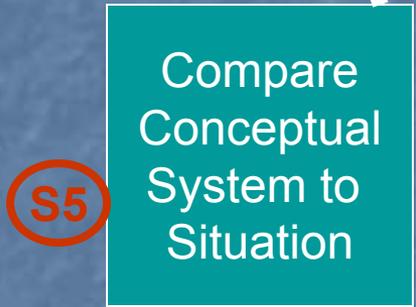
Source: "The Problem of Comparison in Soft Systems Methodology" by Ledingtons

# EDI Matrix and Reframing

Action = Real World Activity = Conceptual System	HIGH DESIRABILITY	LOW DESIRABILITY
HIGH EXPECTANCY	Think about adversary action <b>as</b> positive.  (I)	Think about adversary action <b>as</b> negative.  (II)
LOW EXPECTANCY	Think differently about how adversary action <b>could</b> be perceived as positive.  (IV)	Think differently about how adversary action <b>could</b> be perceived as negative.  (III)

Source: "The Problem of Comparison in Soft Systems Methodology" by Ledingtons

- Learn through debate
- Compare model to real world
- Differences forecast change
- Maintain quadrant consistency using EDI Matrix 2
- Outcomes
  - Project effects-based anticipatory actions
  - Provide baseline for “unexpected” and worst-case outcomes



**S# = SSM Stage**

# Comparisons and Debate by Quadrant for a Given Conceptual System

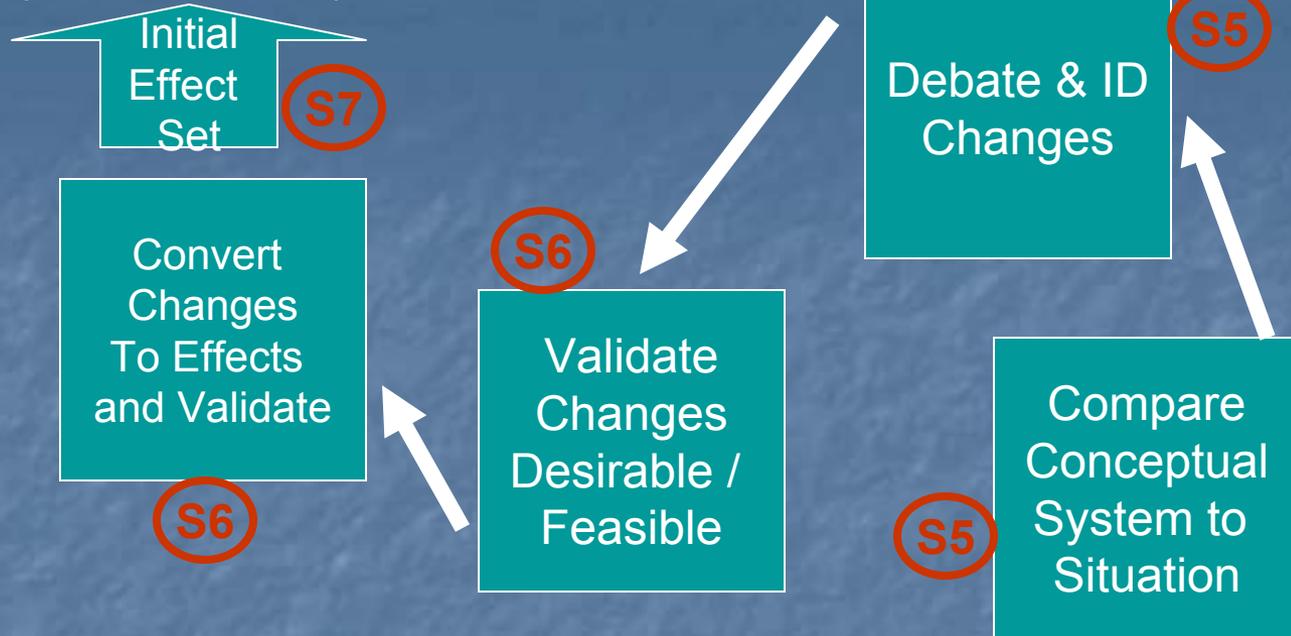
	HIGH DESIRABILITY	LOW DESIRABILITY
HIGH EXPECTANCY	Action -VS- HAS 1(I)  (I)	Action -VS- HAS 1(II)  (II)
LOW EXPECTANCY	Action -VS- HAS 1(IV)  (IV)	Action -VS- HAS 1(III)  (III)

# Using EDI Matrix to Forecast Change

	HIGH DESIRABILITY	LOW DESIRABILITY
HIGH EXPECTANCY	<p>Identify weaknesses of situation in relation to model. develop ways of improving operation of activities</p> <p>(I) <b><u>Add Differences</u></b></p>	<p>Initiate action to remove (or constrain) operational aspects of situation that are like the model.</p> <p>(II) <b><u>Remove Similarities</u></b></p>
LOW EXPECTANCY	<p>Initiate strategic action to action to identify consider, decide, design, implement and develop appropriate purposeful action in situation.</p> <p>(IV) <b><u>Opportunities</u></b></p>	<p>Strategic action to identify any threats that unwanted activity might develop and develop preventative measures.</p> <p>(III) <b><u>Threats</u></b></p>

Source: "The Problem of Comparison in Soft Systems Methodology" by Ledingtons

(E-N-A-R INPUT)



- Ensure changes are desirable, feasible within adversary system
- Convert to Effects using standardized terms
  - Capability-based verb and noun combinations (e.g. prevent disease)
- Validate Effects achievable by friendly forces
  - Capabilities exist and are available in sufficient quantity to achieve desired effects
- Initial Effect Set becomes input into E-N-A-R process

**S# = SSM Stage**

# Limitations

- Only provides “crude look at the whole”
- Qualitative, iterative process
- Requires rigorous quantitative follow-on processes

# Conclusions

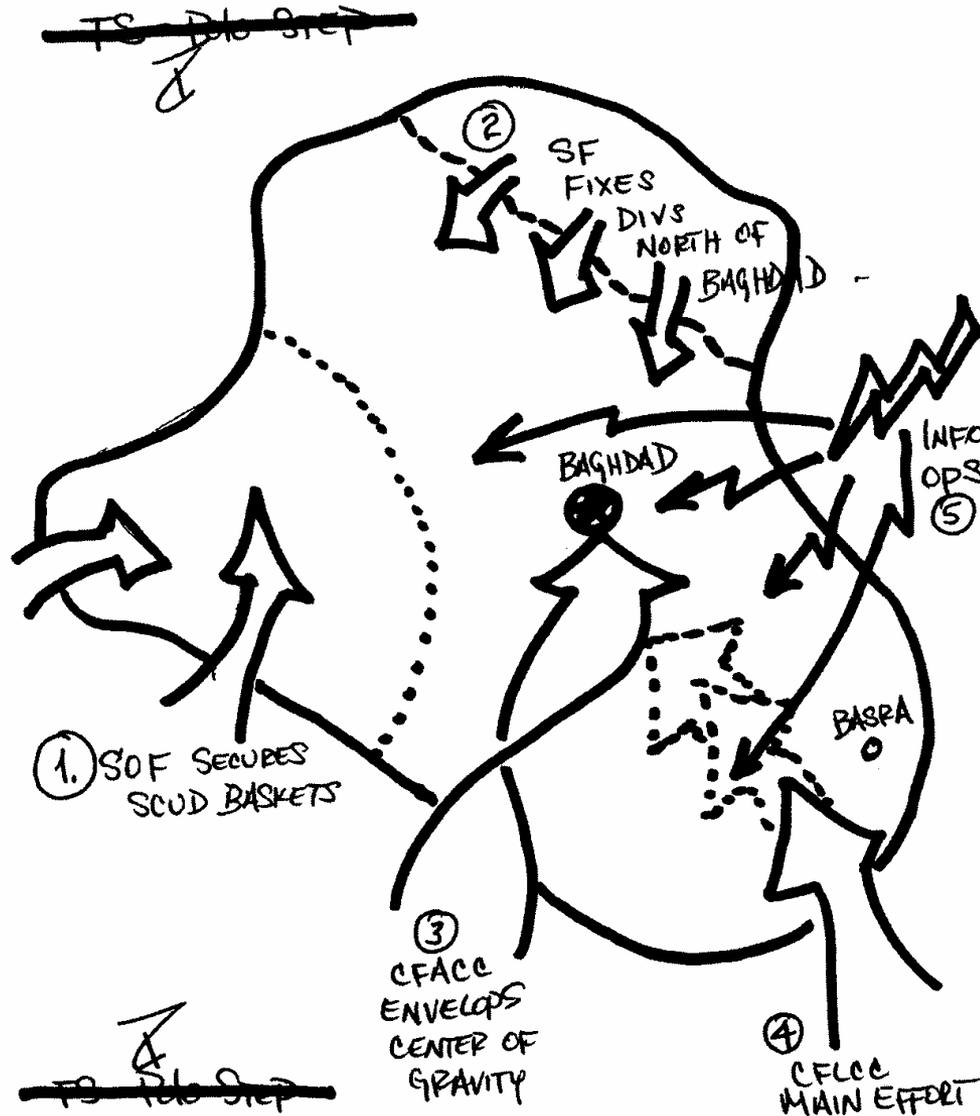
- SSM augments current planning approaches
  - Point toward achieving EBO potential
- Problem structuring methodology
- Leverages multiple perspectives throughout planning process
- Provides missing qualitative front end for current approaches

# Questions ?

# Backup Slides



# FIVE FRONTS



[Stage 3](#)

Source: JP-521 Course Lecture at Air Command and Staff College, Spring '05

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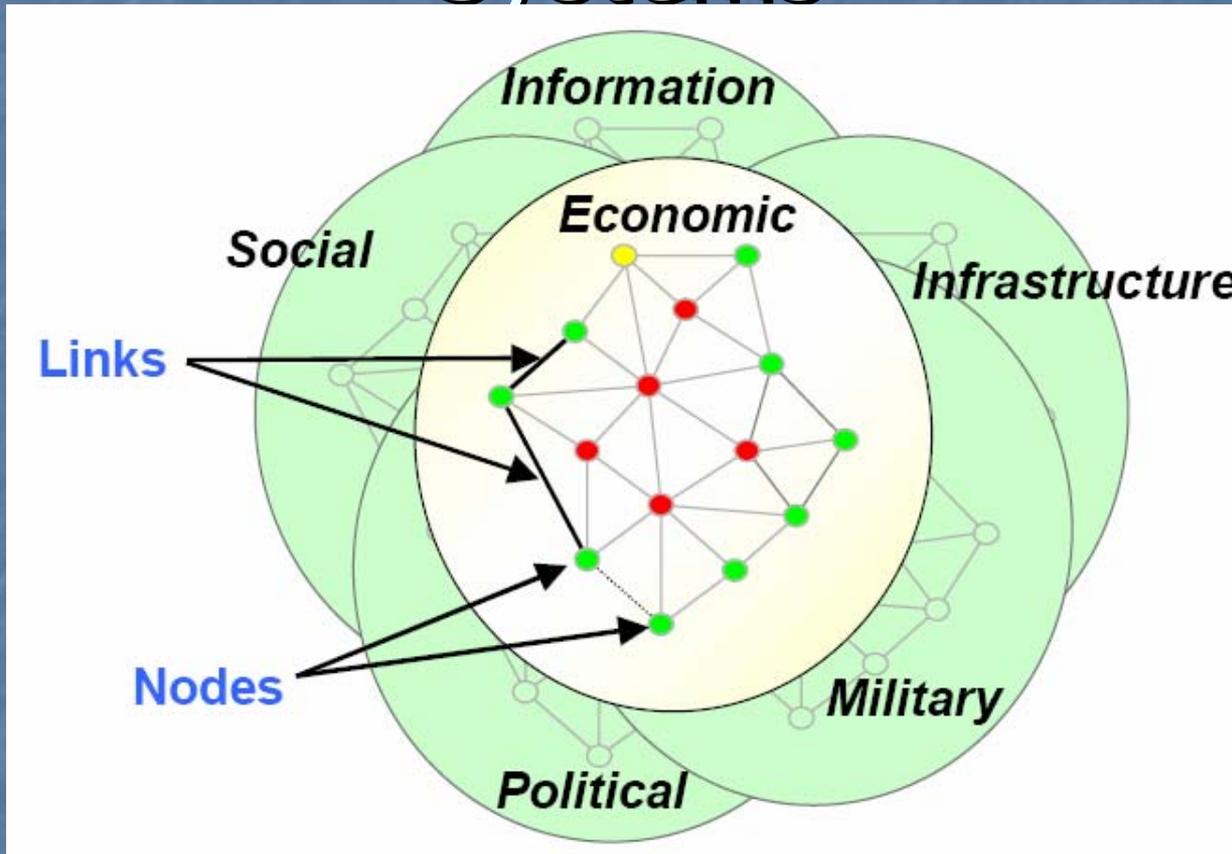
10th ICCRTS - The Future of C2

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# Current Approaches

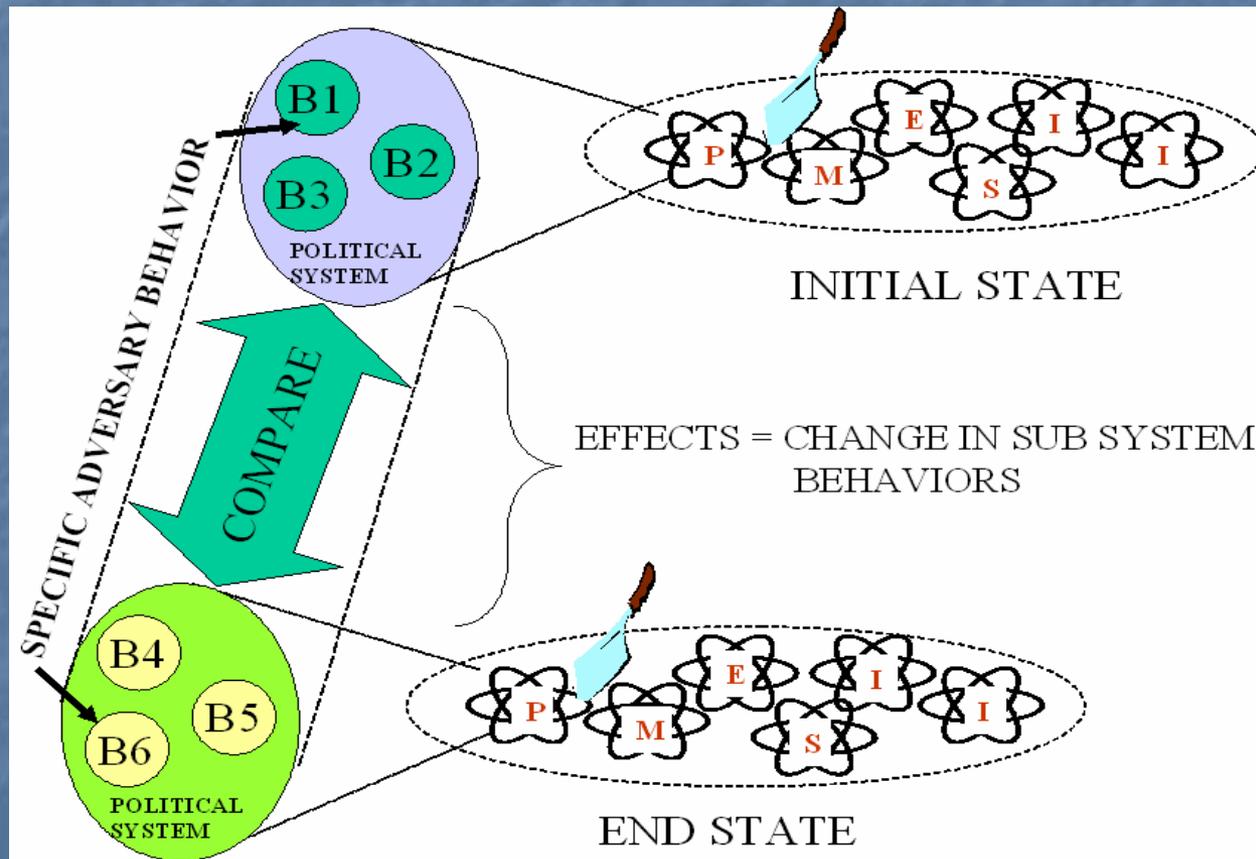
- Strategy-to-Task methodology
  - Focuses on tactical outcomes
  - Does not guarantee endstate solutions
  - Does not accommodate complex systems and behavioral factors
- Boyd: OODA LOOP
- Warden:  $P \times M = \text{Adversary Capability}$ 
  - Drive (P)hysical to Zero
- *Doctrine for Planning Joint Operations*
  - Provides for “orderly and coordinated problem solving and decision-making”

# USJFCOM Adversary System of Systems



Source: "The Joint Warfighting Center Joint Doctrine Series Pamphlet 7" by USJFCOM

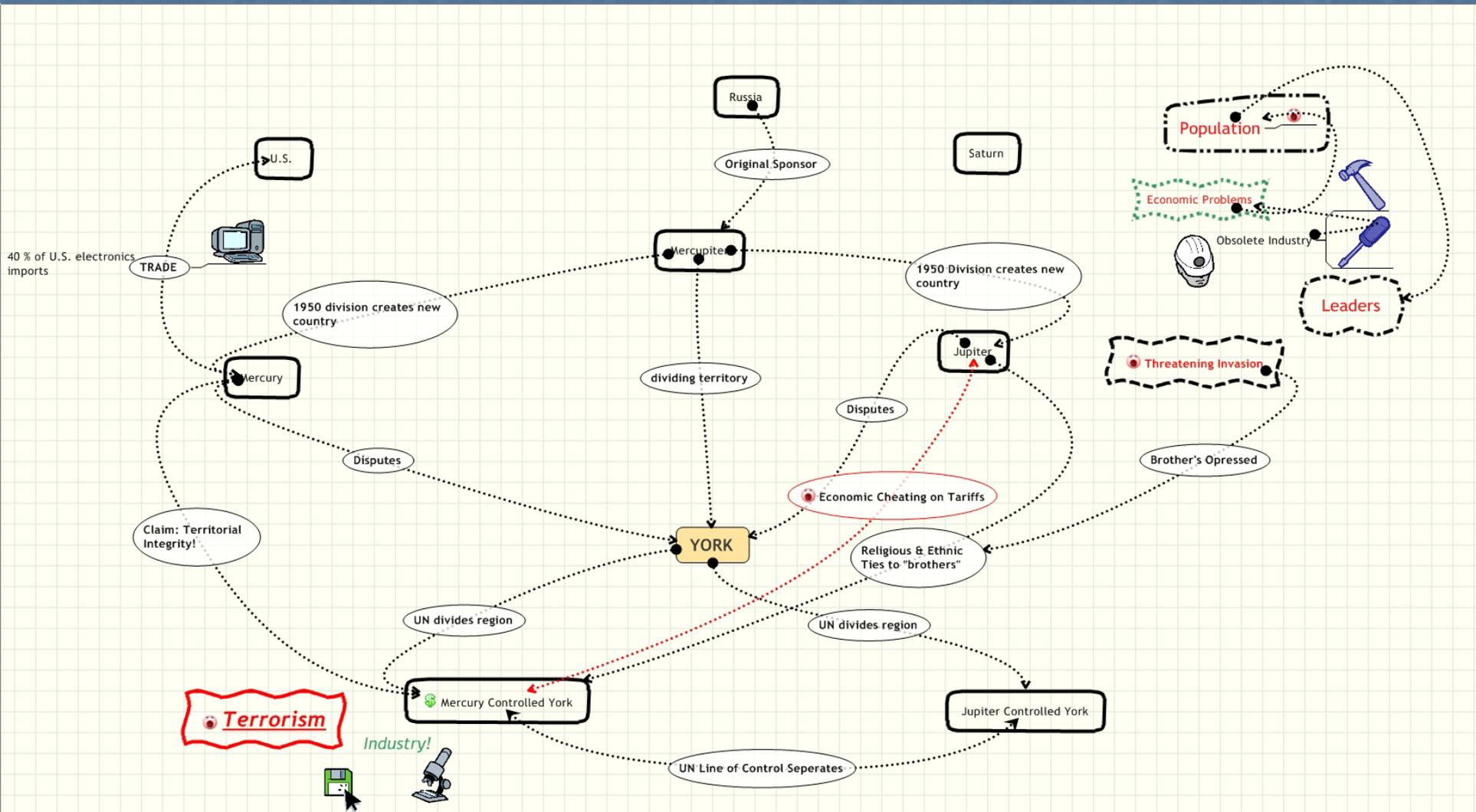
# Current Approach



# Examples of Key Factors from Scenario

<u>Data Element</u>	<u>Inclusion Rationale</u>
History of Region	Both nations were formed from Mercupiter, invasion may be seen as reunification
Culture	Jupiterians have distinct culture, invasion may be viewed as rational alternative if assimilation viewed as unlikely
Key leaders	Will make the decision to invade
United States	US trade is 40%, economic and personal ties
Terrorist Organizations	State-sponsored by both sides, escalating violence destabilizes relationship, may setoff an invasion
Russia	Potential to influence Jupiter behavior and dissuade against invasion
Industrial base of Jupiter	Failing due to high inflation and outdated production methods/ gov't must make radical unpopular changes / original reason for influx into JCY
Industrial Base of Mercury	Initial cause for 1951 influx into MCY
Saturn	Key Jupiter trading partner
Jupiter population	Will support invasion if viewed as just
MCY Jupiterians	Seen as Oppressed brothers of Jupiter population

# Rich Picture Example



# Examples of Scenario Problematic Behavior (Themes) Based on Endstate

<u>Behavior / Action</u>	<u>Why Problematic</u>
Jupiter's threatened Military Invasion	Objective is to prevent invasion and invasion not seen as conducive to long-term
Terrorism by Jupiter's Thunder	Destabilizing the regional security region
MCY Jupiterians circumventing taxes and fees	Potentially negative unintended impact on already failing Jupiter economy

# Examples of Potential HAS based on Scenario Invasion Theme

Conceptual System	WV
Regime Stability System	Jupiter's Government desires to stay in power and is concerned with mounting internal pressures. Capitalizing on a legitimate external enemy will generate popular support for a conflict viewed as "just." Invasion is legitimate means of diverting Jupiter's population away from internal problems.
Economic Improvement System	Poor economy is caused by poor production capabilities. Mercury possesses advanced production capabilities in MCY. Invading Mercury will allow capture of the facilities and production capabilities required to improve Jupiter's economy.
Dispute Resolution System	All other means of resolving the dispute have been exhausted and military action is being used as a last resort. Mercury's recent activities are causing the dispute to be worse.
MCY Jupiterian Protection System	Jupiterians in MCY are being oppressed and persecuted through state-sponsored terrorism. Jupiter has a legal and moral right to protect the MCY majority from tyranny by the minority. MCY's close religious and ethnic ties to Jupiter justify intervention.
Defeat Mercurian Military Forces	Invasion is a prudent military act to prevent Mercury from gaining an unacceptable military advantage. Mercury's forces continue to gain a significant qualitative advantage and something must be done or the regional balance of power may be destroyed.

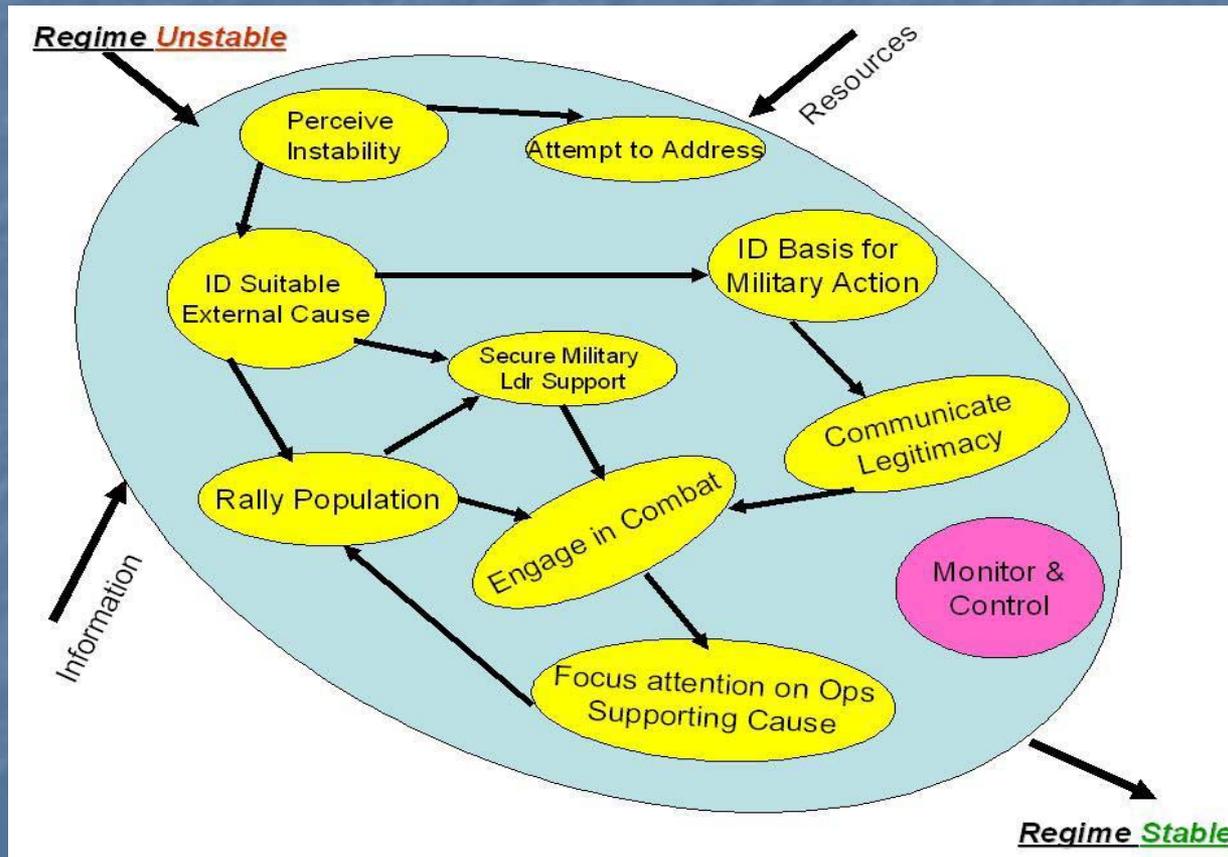
# CATWOE Elements

CATWOE Elements	Scenario Example
C - Customer	Jupiter government leaders
A - Actor	Jupiter key military leaders
T - Transformation	Regime unstable → Regime Stable
W - Weltanschauung	Capitalizing on a legitimate external enemy will generate popular support for a conflict viewed as “just.” Invasion is legitimate means of diverting Jupiter’s population away from internal problems (Political frame)
O - Owner	Senior Jupiter government leaders
E - Environment	UN 1950 Treaty / World Opinion /

# Example of a Root Definition

**Root Definition**: A system owned by Jupiter's national leaders, operated by key military leaders to stabilize the regime by generating popular support among the domestic Jupiterian population; turning attention away from Jupiter's internal problems toward a worthy external cause focusing on an external enemy. The system maintains an heir of international legitimacy.

# Example of System Diagram



# Proposed Next Steps

- Integrate Systems Dynamics into process
- Examine E-N-A-R handoff
- Apply standardized EBO verbs once developed
- Determine appropriate amount of validation for initial effect set

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