

A collection of military medals and a compass on a wooden surface. The medals include a red ribbon with a circular emblem, a blue ribbon with a circular emblem, and two silver Maltese crosses with gold centers. A pair of glasses and a compass are also visible.

# Joint Campaign and Warfare Analysis

**Captain Doug Otte, USN  
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Presentation to  
Chile and United States  
Naval Operations Research Workshop**



# Why do Campaign Analysis?

- ◆ Provide insights into operational planning
- ◆ Better understand future force structure needs
- ◆ Demonstrate the effects of technical and tactical advances
- ◆ Educate officers on operational and logistic demands for potential scenarios

# Scenario-Based Campaign and Warfighting Analysis



## Key Analytic Tasks

- Campaign analysis evaluates CONOPS, objectives and force levels
- Detailed mission models evaluate mission performance
- Evaluate systems with engineering models



# Analysis in Warfare: Sun-Tzu

## Sun-Tzu's calculations:

- “As for military methods: the first is termed measurement: the second estimation [of forces]; the third, calculation [of numbers of men]; the fourth, weighing [relative strength]; and the fifth, victory.
- “Terrain gives birth to measurement; measurement produces the estimation [of forces]. Estimation [of forces] gives rise calculating [the numbers of men]. Calculating [the numbers of men] gives rise to weighing [relative strength]. Weighing [strength] gives birth to victory.”

Kline's Read:

**Distance + Force Structure + Logistics Capability + Time =  
Combat Potential at objective**

**Combat Potential vs Enemy Combat potential comparison  
at objective generates courses of action for victory!**

# Some Historical Examples of Analysis in Warfare

- ◆ Sun-Tzu, Clausewitz, Jomini, and other classical writers discuss numbers in warfare from their strategic writings.
- ◆ Likewise, Lanchester and Hughes (and many others) created equations to describe attrition and naval warfare respectively.



# Some Historical Examples of Analysis in Warfare

- ◆ *Admiral Doenitz “Battle of Atlantic” winning criteria: 600K – 800K tonnage sunk*
  - *Analytical Derivation*
- ◆ *War Plan Orange*
  - *Wargaming*
- ◆ *Battle of Atlantic (Birth of Ops Research)*
  - *Search Theory*
- ◆ *Battle of Bismark Sea (WWII)*
  - *Game Theory*
- ◆ *Vietnam Air-to-Air Combat Analysis*
  - *Data Analysis*
- ◆ *Gulf War, Kosovo, and OIF Effects of Strikes*
  - *Network Analysis and Scheduling*
- ◆ *Current OPLANS?*





# Campaign and Warfare Analysis: Tidy Statements about Untidy Phenomena

- ◆ **SO many estimates and assumptions:**
  - *Weapon accuracy and effectiveness*
  - *Sensor effectiveness*
  - *Aircraft availability, load capacity, turn-around times, range*
  - *Enemy Capabilities*
- ◆ **Then we build “Transparent” and artificially neat models in an attempt to:**
  - *Show a clear cause and effect*
  - *By well defined inputs that cover all the vital variables!*
- ◆ **NOT an engineering approach!**
  - *Messy problems, “dirty data”, complex activities, multiple courses of action for both sides, unclear results*
  - *Best: Hope to derive gross-level patterns and identify what is important.*

And it's fun!



## And Clausewitz says:

“...Absolute, so-called mathematical factors never find a firm basis in military calculations...In the whole range of human activities, war most closely resembles a game of cards...the art of war deals with living and with moral forces. Consequently, it cannot attain the absolute, or certainty; it must always leave a margin for uncertainty, in the greatest things as much as in the smallest.”

*On War, p. 86*

# Two Types of Campaign Analysis

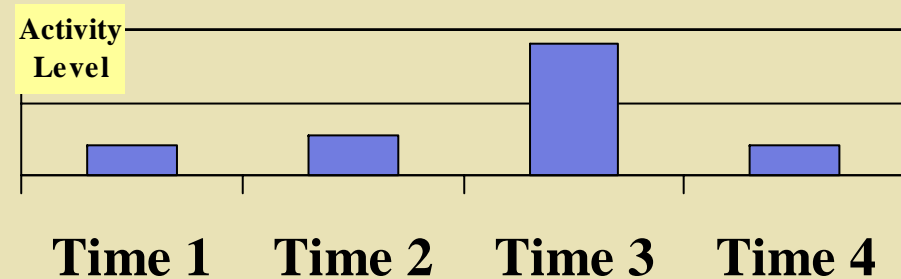
## ◆ *Force on Force*

- “Pulses”
- *Sequential*
- *Set Battles*

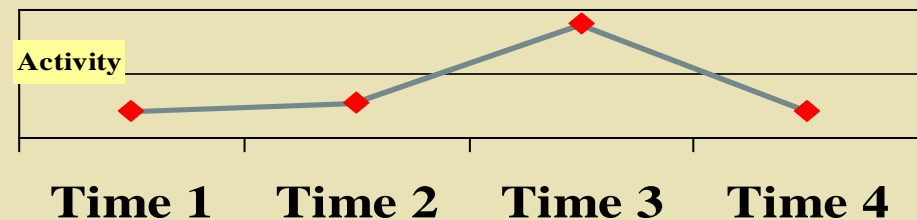
## ◆ *Predator-Prey*

- *Seasonal*”
- *Continuous*
- *Cumulative*

### Force on Force



### Predator-Prey



And it's fun!

# Campaign Analysis is IF – THEN Statements

IF:

- We Use these Inputs
  - Assumptions
  - Variables
  - Estimates
- AND we use this Model

Then:

We get these Results

Inputs

+

Models

Process

Results



# Models

- ◆ White Papers: Logical and based on analytical computations
- ◆ Mathematical Statements and Applied Math:
  - Optimization
  - Search Equations
  - Statistics and Probability
  - Data Analysis
- ◆ “Closed” Simulation
- ◆ War Game (“Manned” Simulation)
- ◆ Field Experiments

Each has strengths and weaknesses depending on the problem!

Inputs

+

Models



Process



Results



# Campaign Inputs: Five (Necessary and Sufficient)

- ◆ Scenario
- ◆ Blue Force Distribution
- ◆ Green Force Distribution
- ◆ Blue Force Capabilities
- ◆ Green Force Capabilities

*Inputs*

+

Models



Process



Results



# Process

- ◆ A Well Defined Problem (in Warfare?)
- ◆ A Competent Decision Maker
- ◆ Skillful analysts
- ◆ Satisfactory Inputs

Inputs

+

Models



Process



Results



# Six Potential Outputs (Results and Conclusions)

- ◆ Patterns of Activity
- ◆ Focused Debate
- ◆ Synthesized Information
- ◆ Informed, Quantitative, Specific – and Incomplete—Advice
- ◆ Side Benefits
- ◆ “Predictions” don’t appear. Who will win?  
*Is not answered!*

Inputs

+

Models



Process



Results



Conclusions





## “Bottom Line” of Warfare Analysis

Does it aid the Decision Maker?  
Does it help quantify risk?