Insights from a decade of Campaign Analysis, Wargaming, and studies of fleet architectures and tactical analysis

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INTRODUCTION

Or, how we do it

Naval Postgraduate School: Integrating real-world issues with graduate education
2006-2016 Campaign Scenarios

KOREA Counter-SOF

Counter-Piracy Campaigns

Indian-Pakistan Conflict

Hybrid War in the Baltic

Russian-Japanese Conflict in Kurils

Nigeria Stabilization

Mindinao SOF operations

Blockade of Okinawa

Cruise Missile Defense of U.S.

Arctic Ocean Conflict

South China Sea Sea Conflict

Strait of Hormuz
WARFARE INNOVATION CONTINUUM

“Creating Asymmetric Warfighting Advantages”

2015 Total Ships Systems Engineering

Energy Logistics in Warfare Operations

IW Systems Engineering Capstone

RoboEdu Design Challenge

2016 Total Ships Systems Engineering

SEA 23 Capstone Project:: UxS in Cross Domain Operations

FY15 Summer Qtr
- July
- August
- September

FY16 Fall Qtr
- October
- November
- December

FY16 Winter Qtr
- January
- February
- March

FY16 Spring Qtr
- April
- May
- June

E-Week

Wargaming

Joint Campaign Analysis

JC4I Capstone

E-Week

Joint Campaign Analysis

Warfare Innovation Workshop

CRUSER Innovation Thread 4: “Leveraging Unmanned Systems to Create Asymmetric Advantages in Contested Environments”

Indonesian Littoral Conops Course

OPTECH (Japan) Ops and Technology Workshop

Littoral Operations Center

Wargame Planning and Innovation Workshop

SEA 23 Final Report

Littoral Operations Center

Warfare Innovation Continuum
COURSE MISSION:
THIS COURSE STUDIES THE DEVELOPMENT, USE, AND RECENT APPLICATIONS OF CAMPAIGN ANALYSIS IN ACTUAL PROCUREMENT, FORCE STRUCTURE, AND OPERATIONS PLANNING. EMPHASIS IS ON FORMULATING THE PROBLEM, CHOOSING ASSUMPTIONS, STRUCTURING THE ANALYSIS, AND MEASURING EFFECTIVENESS.

4-Week Mini-study deals with realistic future scenario that students are challenged to provide concepts for employment and quantitative assessment of risk, including technical injects.

Students come from:
Ops Research, Joint Operational Logistics, Systems Engineering Analysis, Modeling Simulation and Virtual Environments, and Defense Analysis programs.

Navy, Marines, and Army officers (all branches)

United States, Germany, Turkey, Pakistan, and many others

ACTUV Results
Example Technical Injects

- Tactically Exploited Reconnaissance Node
- Undersea Constellation
- Flotilla of smaller missile combatants
- All domain naval integrated fires capabilities
- Shore based ASCM
- Enhanced LPD-17
- ACTUV
- Lasers
- Non-lethal stopping
Concept of Operations
Tactical level analysis to understand campaign effects

Runway Damage Simulation

(95% Confidence of < 1500m by < 15m useable runway operating surface remaining)

Monte Carlo Impact Points Across Runway

Analyzing strike effects on Fiery Reef runways

Coyote UAV’s tactical employment with P-8 sonobuoy field.
Length of ASW campaign and weapon usage sensitive to P-8 introduction

Phase-1 Duration (Undersea Assets employed only)

# Mk 48 Torpedoes Used Increases and # Mk 54 Torpedoes Decreases as the Length of Phase 1 Increases. The Total Number of Torpedoes Used Remains Approximately the Same.

* All numbers are mean of 1000 runs
Addition of P-8A MAD capability via UAV

Can remote MAD capability reduce the ASW Find, Fix, Track, Target, Engage (F2T2E) time sequence and enhance the ASW campaign?

Average Time to Engage Sub Decreases with # of Coyotes Used. # of Coyotes to be Carried by P-8 Increases with # to be Used at One Time.

Too Many!

* All numbers are mean of 1000 runs
Technical Inject: Campaign effects of P-8 Coyote capability

Use of Coyote UAV Has Some Reduction in # of Blue Subs Lost. Effect Increases as the Length of Phase 1 Decreases

Use of Coyote UAV Has Some Reduction in # of Days of ASW Campaign. Effect Increases Slightly as the Length of Phase 1 Decreases

* All numbers are mean of 1000 runs
Joint Campaign Analysis and Wargaming Connection

Technology Injects and Concepts

Red Response Blue Concepts

Technology Injects and Concepts

Summer Joint Campaign Analysis Class

Fall Wargaming Class

Winter Joint Campaign Analysis Class

Maritime War 2030 Scenario
NPS Wargaming Course

• The first half of the Wargaming Applications course teaches the fundamentals of wargaming using a mix of lectures and practical exercises. Concludes with the completion of the “Wargaming Apprentice Certification Exam.”

• Wargaming Capstone Project: The second half of the course focuses on applying wargaming fundamentals to design, develop, conduct and analyze a wargame to answer a DoD sponsor's actual requirement.

DoD Capstone Sponsors: 7 Navy, 5 Joint, 3 Int’l, 2 Army, 1 Marine Corps, 1 Industry.
Littoral Flotilla is an exploration into the application of innovative joint and combined naval formations conducting combat operations in the littoral. The goal of the project is to foster international cooperation in the development of Littoral Warfare and to expand awareness of the challenges associated with operations in the global littorals.
And hundreds of Theses

- PROJECT JASON: Countering UCAV
- Tactical memo development
- Logistics Network analysis: Fuel – Air
- Alternative Communications paths
- Salvo Warfare
- Red’s doctrine analysis
- Distributed Forces
BIG TRENDS ACROSS TEN YEARS

Some are now no surprise….
A sample of Trends

- Missile and Robotics: enablers for Red and Blue

Red
- Terrestrial’s growing influence on maritime domain, particularly where it counts
- High/Low ISR mix difficult to defeat

Blue
- Lead with Undersea Power
- Disburse airpower and surface action groups.
- It takes a village: rediscovering USAF missile trucks or more missiles please…..
- CVN’s importance as mid-ocean air provider for high end conflict
Characteristics of modern maritime warfare

- **Offense** is the stronger form of naval tactical warfare
  
  “Fire effectively first” (Hughes)

- **Defense** is the stronger form of naval operational warfare
  
  Sea Denial is easier than Sea Control

We observe U.S. Navy is currently on the disadvantaged side in both these areas in warfighting and procurement.
Naval Warfighting Ages

- **Oars**: Long Time
- **Sail and Steam**: Sail to 1840, Steam to 1940
- **Ram**: Long Time
- **Gun**: Sail to 1840
- **Aircraft**: 1940 – 1970
- **Missile**: Nuclear 1950, Conventional 1967
- **Robotics**: 2010 –

Small and Distributed
Implications for Missile and Robotics Age

- Easier to leverage the power of quantity:
  - Swarms (Harpies, Boats, etc)
  - Cost effectiveness of offensive systems over defensive systems is enhanced

- Enables focus on package delivered instead of delivery platform

- Options:
  - Very advanced, autonomous and expensive systems
  - Basic, “throw away” and inexpensive systems: few vs. many
TRENDS IN THE MARITIME THREAT
Who can best fight in the night? (EM night that is)

- Threat’s combination of high (satellite) and low (naval auxiliary) targeting methods challenge Blue’s “left” of kill chain capabilities
- “Old school” organic targeting methods become more important when everyone’s Precision Navigation and Timing is degraded
HOW BLUE RESPONDED....
Taking the “Low Road”

- Lead with submarines (deny sea space)
- Develop undersea ISR, PNT, and arsenal systems (Undersea constellation)
- Get missiles into AOR
- Genesis of “War at Sea Strategy” (Hughes/Kline 2012 NWCR)
In the Missile Age: Focus on Missiles, not platforms

- Mass missiles, not delivery platforms.
  - Disperse Air Wings
  - Distribute surface ships
  - Establish land missile outposts
  - Establish undersea “arsenals” like DARPA’s Hydra
  - Use joint assets (Bombers) as missile trucks

- This requires buying more offensive missiles and force-wide training
In the Robotics Age: Focus on Robotics, not platforms

- **Robots forward!**
  - Combine manned and unmanned systems
    - Section of aircraft: unmanned missile carrier forward, manned fighter back
    - ACTUV pairs for bi-static search with Surface Action Groups
  - ACTUV as missile carrier (box launcher)
  - Many, disposable UxS ISR and environmental sensors

- **Unmanned Systems viewed by themselves, not as extension of manned platforms**
Other Observations

- Carriers of aircraft most impactful just outside missile range
- Vulnerable logistics and repair system (network analysis)
  - Fuel, parts and ammunition
  - Not prepared to handle damaged ships
  - Distributed and Expeditionary Logistics lessons from WWII
More Observations

- Unique use of evolving technology, more innovation than revolution
- More, less expensive sensors and platforms with more focused missions in dispersed operations
- Push C2 to lowest level:
  - Good knowledge of mission
  - Independent, pre-coordinated and *quiet* operations
  - More WWII Submarine Operations than Desert Storm

**Ideas for a more resilient force**
Technology and Strategy: Why I like being tactical

- Technology enhances maritime tactical capabilities
- Tactical capabilities provide additional operational level ways and means
- Operational level ways and means inform strategic choices.
Discussion
“Will emergent technologies (unmanned systems, advanced computing power, automation, advanced sensor capabilities, laser weapons etc.) allow us to fight effectively in the complex and an electromagnetically contested littoral environment against sea denial forces?”
A two-year event thread begins with a Warfare Innovation Workshop (WIW) and culminates with a research presentation at ONR showcasing the results.

- **Fall Year 1**
  - Warfare Innovation Workshop
  - Teams of junior officers and early career engineers propose concepts within a scenario
- **Spring Year 1**
  - Technical Continuum
  - Review of Technical Papers and proposals for concepts selected from Warfare Innovation Workshop. Includes a Research Fair
- **Spring Year 2**
  - Field Experiment
  - Testing of physical models as a follow-on to the Tech Continuum
- **Summer Year 2**
  - Research Expo
  - Expo to showcase the results of the Innovation Thread – “Concept to Experimentation”
2011 – 2013
Thread #1 – UxS Employment in Naval Operations
- WIW (SEP 11)
- TechCon (APR 12)
- Field Exp. (APR 13)
- Expo (JUN 13)
Cancelled due to Travel Restrictions

2012 - 2014
Thread #2 - Advancing the Design of Undersea Warfare
- WIW (SEP 12)
- TechCon (APR 13)
- Field Exp. (APR 14)
- Expo (JUN 14)

2013-2015
Thread #3 - Distributing Future Naval Air and Surface Forces
- WIW (SEP 13)
- TechCon (APR 14)
- Field Exp. (APR 15)
- Expo (JUN 15)

2014-2016
Thread #4 – Warfare in a Contested Littoral
- WIW (SEP 14)

2015-2017
Thread #5 – Asymmetric Advantages
- WIW (SEP 15)
Week-Long Basic Analytic Wargaming Course (Mobile Education Team (MET) Concept)

- Built around hands-on practical exercises coordinated with the sponsor—NOT a lecture-dominated course.
- Purpose is to develop a wargaming core competency within an organization.
- By the end of the week, student teams conduct a wargame that they designed during the course.

Course for USMC (OAD AND I&L sponsored) completed in Quantico Feb 2016

Upcoming courses: 9th MSN SUPPT CMD, May ‘16; DST-Group (Australia), July ‘16; CENTCOM, FY16-17

Potential Course Sponsors: Royal Canadian Navy, DTA (New Zealand), French and Indian Armed Forces
AND MY REVENUE FORECAST SAYS...

DID YOU MAKE ANY ASSUMPTIONS?

I MADE A LOT OF THEM.

THEN WE DON'T BELIEVE YOUR FORECAST.

CAN I TELL YOU ABOUT IT ANYWAY?

DO WHATEVER MAKES YOU FEEL LESS ABSURD.