A Maritime Phase Zero Force for the Year 2020

9 JUNE 2009
• Systems Engineering and Analysis Program
• Project Tasking
• Organization/Problem Solving Process
• Phase Zero Background
• Missions
• Perception Mapping
• Modeling Methodology
• Cost Estimation
• Threats to Stability
• Force Structure
• Regional Stability
• Areas of Future Focus
Systems Engineering and Analysis

LT Chet Lee
• The Systems Engineering Analysis (SEA) curriculum provides a unique education bridging the knowledge bases of both Systems Engineering and Operations Analysis.

• Teaches U.S. Navy Unrestricted line officers (and NGSS civilians) how the Navy builds and fights large combat systems.

• Topics of study include technologies (sensors, weapons, information systems, networks, C4I), and techniques (combat simulation, modeling, optimization, project management, fundamentals of systems engineering).
• Supports team-oriented research and analysis that links technical solutions to tactical problems, enhances understanding of the Navy’s Requirements-Setting, Planning, Programming, Budgeting and Execution (PPBE) and acquisition processes, and the manner in which they impact warfighting acquisition programs.

• The SEA program focuses on developing solutions to future needs. Past studies Include:
  – UAV systems
  – Future expeditionary warfare systems
  – Command & Control
  – Laser defense technologies
  – Advanced aviation lift
  – Advanced ship design

• SEA Integrated project teams include USN Line Officers, Government Contractors and Temasek Defense Systems Institute (TDSI) students
Project Tasking
• Design a system of systems to employ a regional Maritime Theater Security Force to conduct all maritime missions associated with Phase 0 operations. Consider current fleet structure and funded programs as the baseline system of systems to execute security and shaping missions in developing these concept of operations, then develop alternative fleet architectures for platforms, manning, command and control, communication, logistics and operational procedures to evaluate against the current program. A complete redesign of a naval force capable of executing phase 0 operations, employable by 2020, and using total procurement and operating costs of $1.5B (FY08 constant dollars) per annum, should be one of the alternatives.
• All maritime missions associated with Phase Zero operations
• Consider current fleet structure and funded programs as the baseline system of systems to execute security and shaping missions
• Employable by 2020 (life-cycle through 2050)
• Total procurement and operating costs of $1.5B per year
• Force Selected:
  - JMSDF DDH
    (7) CH-53K
    (6) RQ-8
  - LPD-17
    (2) SH-60
    (3) RQ-8
    (2) M-80 Stiletto
  - JHSV
  - Visby
    (3) RQ-8

Annual Cost: $305 million
Project Sequence

Phase 0

Functional Decomposition

13 Missions

Perception Mapping

PZ Triangle

Missions

Modeling/Force Structure Development

Alternative Force Structures
Organization/Problem Solving Process
Organization/Problem Solving Process
SEA-15/TDSI Integrated Project

33 Students
Track Advisors
Prof David Meyer
Prof Christopher Brophy
Prof Bard Mansager
Prof Murali Tummala

Project Advisor
Prof Gary Langford

Chet Lee
Project Manager

Weng Wai Leong
Deputy Project Manager

Phase Zero
Research
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Chiong Perng Ong
James Pandya
Leslie Tan
Chee Yong Ng
Quek Anthony

Systems
Engineering
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Brandon Luedke
Kian Sing Tan
Han Chuan Lee
Gerald Ho

Force Structure
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Jeffrey Alexander
Smith
Chun Heong Eng
Kwang Hui Yeo
Chuan Hao Mok

Threat Team
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Wee Lee Chia
Giam Tan
Roy Ong
Wan Yin Chia

Integration
Chris Gahl
Robert Scott Bair
James Russell Mcclure
Chey Hock Sim
Hong Aik Lee

Operations Analysis
Tim Thurston
Elaine See
Yew Chong Foong
Nir Rozen
Chez Yee Ang
Problem Solving Process

Mission Requirements

Stakeholders

Phase Zero Research

Historic Forces

Modeling

Cost Analysis

Force Structure Generation

Threat Analysis

Phase Zero Force Proposals
Stakeholders

- N-81 RADM McCarthy (Ret.) *
- Component Commanders – SOUTHCOM *
- US Aid Organization
- World Bank *
- Foreign Navies *
- Red Cross *
- 4th Fleet *
- State Department
- Department of Homeland Security *
- N-86 – RADM Myers
- NAVSURFORS – VADM Curtis
- J9 USJFCOM – RADM Davenport
- US Fleet Forces – RADM Busby
Phase Zero Background
Maritime Strategic Imperatives

Regionally Concentrated, Credible Combat Power
- Deter major power war
- Win our nation’s wars
- Limit regional conflict

Secure Our Homeland, Citizens, and Interests around the World
- Contribute to homeland defense in depth
- Foster & sustain cooperative relationships
- Prevent or contain local disruptions

The bottom “egg” is new

Globally Distributed, Mission-Tailored Maritime Forces

US Naval War College
Why Phase Zero

• To enhance the stability of a region
• Changing role of the military
• Significant opportunities for cost savings
  – Opportunities for reductions lives and equipment lost
• Build Coalitions
• Increase probability of interdiction of drug trafficking from South America to U.S.
- Joint Publication 3 (2008)
  - Shaping guidance
  - Multi-national emphasis
- National Security Strategy 2005
- Naval Operations Concept 2006

Continued focus on the U.S. military’s role in influencing regional stability in order to prevent large scale conflicts
Joint Publication 3
• Actions that are necessary for a phase zero force to be able to accomplish to sustain itself but are not phase zero missions
• Actions that are not typically thought of as shaping actions but enhance stability
• Examples:
  – Self Defense
  – Anti-Piracy
  – Anti-Smuggling
• A phase zero force will work closely with multinational, interagency and other partners to maintain or enhance stability, prevent or mitigate crises and set the conditions for access and responsive crisis intervention.
Missions of Phase Zero
Phase Zero Missions

The Phase Zero force must be able to fulfill the following missions requirements:

1. Enforce **freedom of navigation**
2. **Build relations** with local governments
3. **Train** local defense forces
4. Support the **equipping** of the local defense forces
5. **Share intel/info** within the force and with local governments
6. Conduct **anti-terrorism** operations
7. Conduct and support **anti-piracy** operations
8. Support **anti-illegal fishing** operations
9. Assist local government in **restoring critical infrastructure** (shelter, power and sanitation)
10. Provide **civil support** in case of crisis (water, food and medical)
11. **Defend itself** against threats
12. Support **anti-smuggling** operations
13. **Non-combatant evacuation operations**
• Many of the missions overlap
• Commonalities in tools and methods for completing each mission
• 3 missions that are different enough from each other
• A force that can conduct 3 critical missions can also accomplish all 13 of the Phase Zero missions
Perception Mapping

LT Tim Thurston
- Used in information visualization for exploring similarities or dissimilarities in data
- Algorithm starts takes input of item-item similarity matrix
- Assigns a location to each item in N-dimensional space
- For small N, resulting locations may be displayed in a graph
PERMAP for MDS

- Free
- Windows-based
- Real-time
- Interactive
- Metric and non-metric MDS
- Up to 8 dimensions
- Adjustable Variable Weighting
- Missing Values Allowed

Developed by Dr. Ronald B. Heady, University of Louisiana at Lafayette and Dr. Jennifer L. Lucas, Agnes Scott College
## PERMAP MDS Example

<table>
<thead>
<tr>
<th></th>
<th>SEA</th>
<th>LAX</th>
<th>PHL</th>
<th>MIA</th>
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</table>
Modeling Methodology
Overview

Civil Support CONOPS
- Lift Parameters

Storage Parameters

ID Parameters

Intercept Parameters

Smuggling CONOPS

Requirements

Optimization

Formulation

Force Structure
“Worst Case” Concept

- No harbor or beach landing area available
- 100% lift by aircraft
- Water produced aboard ship
- All supplies and equipment delivered via slung load
- SH-60 not capable of carrying a HMMWV
- Daylight flight operations only
Civil Support: Assumptions

- **SH-60**
  - Delivery speed = 80kts, return Speed = 146kts,
    Mission time = 9hrs/day, 1 piece of equipment/sortie
- **MV-22**
  - Delivery speed = 100kts, Return speed = 241kts,
    Mission time = 10hrs/day, 2 pieces of equipment/sortie
- **MH-53**
  - Delivery Speed = 100kts, Return Speed = 170kts,
    Mission time = 9hrs/day, 2 pieces of equipment/sortie
- Water is carried in collapsible, variable volume bladders for maximized sortie capacity
- 85% availability for all aircraft
- Slung loads and personnel take 1 and 5 minutes for pickup/dropoff respectively
- Force Delivers first supplies after 24 hours
- Supply rate ramps up to full capacity after 5 days
- Standard shipping container measures 8’x8’x20’

![Graph showing the relationship between quantity (lbs) and days](image-url)
## Modeling: Civil Support Inputs

### Parameters

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Scenario Severity</th>
<th>Low</th>
<th>Mean</th>
<th>High</th>
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</thead>
<tbody>
<tr>
<td>Number affected:</td>
<td></td>
<td>50,000</td>
<td>100,000</td>
<td>150,000</td>
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<tr>
<td>Number injured:</td>
<td></td>
<td>2,500</td>
<td>5,000</td>
<td>7,500</td>
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<tr>
<td>Number of &quot;camp&quot; sites:</td>
<td></td>
<td>3</td>
<td>5</td>
<td>8</td>
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<tr>
<td>Number of &quot;camp&quot; sites containers</td>
<td></td>
<td>15</td>
<td>30</td>
<td>45</td>
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<tr>
<td>Penetration:</td>
<td></td>
<td>0</td>
<td>25</td>
<td>50</td>
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<tr>
<td>Time to full capacity (days):</td>
<td></td>
<td>5</td>
<td>5</td>
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### Total Delivered

<table>
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<th>Scenario Severity</th>
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<th>Mean</th>
<th>High</th>
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</thead>
<tbody>
<tr>
<td>Food (lbs):</td>
<td></td>
<td>313,000</td>
<td>625,000</td>
<td>938,000</td>
</tr>
<tr>
<td>Food (ft^3):</td>
<td></td>
<td>12,800</td>
<td>25,500</td>
<td>38,300</td>
</tr>
<tr>
<td>Food (pallets):</td>
<td></td>
<td>219</td>
<td>439</td>
<td>658</td>
</tr>
<tr>
<td>Water (gal):</td>
<td></td>
<td>62,500</td>
<td>125,000</td>
<td>188,000</td>
</tr>
<tr>
<td>Bladders:</td>
<td></td>
<td>84</td>
<td>167</td>
<td>250</td>
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</table>

### Maximum rate

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Scenario Severity</th>
<th>Low</th>
<th>Mean</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food (lbs/day):</td>
<td></td>
<td>125,000</td>
<td>250,000</td>
<td>375,000</td>
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<tr>
<td>Water (gal/day):</td>
<td></td>
<td>25,000</td>
<td>50,000</td>
<td>75,000</td>
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<tr>
<td>Water (lbs/day):</td>
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<td>208,000</td>
<td>415,000</td>
<td>623,000</td>
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<tr>
<td>Other (Medical, Camp sites lbs/day):</td>
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<td>81,100</td>
<td>161,000</td>
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<td><strong>Total (lbs/day):</strong></td>
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### Medical

<table>
<thead>
<tr>
<th>Parameters</th>
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<th>High</th>
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</thead>
<tbody>
<tr>
<td>Doctors:</td>
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<td>7</td>
<td>13</td>
<td>19</td>
</tr>
<tr>
<td>Nurses:</td>
<td></td>
<td>25</td>
<td>50</td>
<td>75</td>
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<tr>
<td>Surgeons:</td>
<td></td>
<td>4</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>Assistants:</td>
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<td>7</td>
<td>13</td>
<td>19</td>
</tr>
<tr>
<td><strong>Total Medical Personnel:</strong></td>
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<td>43</td>
<td>83</td>
<td>123</td>
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</tbody>
</table>

### Marines

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Scenario Severity</th>
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<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Devil Dogs:</td>
<td></td>
<td>127</td>
<td>209</td>
<td>383</td>
</tr>
<tr>
<td>Quadcons:</td>
<td></td>
<td>8</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>HMMWVs:</td>
<td></td>
<td>11</td>
<td>18</td>
<td>31</td>
</tr>
<tr>
<td>Floodlight Sets:</td>
<td></td>
<td>6</td>
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<tr>
<td>Generator Sets:</td>
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<td>6</td>
<td>10</td>
<td>16</td>
</tr>
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</table>
## Modeling: Civil Support Inputs

### Medical Scenario Severity

<table>
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<td>75</td>
</tr>
<tr>
<td>Surgeons:</td>
<td>4</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
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<td>13</td>
<td>19</td>
</tr>
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<td><strong>Total Medical Personnel:</strong></td>
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<td><strong>83</strong></td>
<td><strong>123</strong></td>
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</tbody>
</table>

### Marines Scenario Severity

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</tr>
<tr>
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<td>10</td>
<td>16</td>
</tr>
</tbody>
</table>

### Storage Scenario Severity

<table>
<thead>
<tr>
<th></th>
<th>Low</th>
<th>Mean</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food (lbs):</td>
<td>313,000</td>
<td>625,000</td>
<td>938,000</td>
</tr>
<tr>
<td>Food (ft^3):</td>
<td>12,800</td>
<td>25,500</td>
<td>38,300</td>
</tr>
<tr>
<td>Food (pallets):</td>
<td>219</td>
<td>439</td>
<td>658</td>
</tr>
<tr>
<td>Water (gal):</td>
<td>62,500</td>
<td>125,000</td>
<td>188,000</td>
</tr>
<tr>
<td>Bladders:</td>
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<td>167</td>
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### "Vehicle" Storage Scenario Severity

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<tr>
<td>Marine Quadcon (ft^2):</td>
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<td>HMMWVs (ft^2):</td>
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<tr>
<td>Floodlight Sets (ft^2):</td>
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<td>480</td>
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<tr>
<td>Generator Sets (ft^2):</td>
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<tr>
<td><strong>Total (ft^2):</strong></td>
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<td><strong>3,520</strong></td>
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### Total Delivered Scenario Severity

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<tr>
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<td>125,000</td>
<td>188,000</td>
</tr>
<tr>
<td>Bladders:</td>
<td>84</td>
<td>167</td>
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<tr>
<td>Camp sites (lbs):</td>
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<td>Surgeons/assistants (lbs):</td>
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<td><strong>Total (lbs):</strong></td>
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<td>Camp sites (ft^3)**:</td>
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<tr>
<td>Surgeons/assistants (ft^3):</td>
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<tr>
<td>Water Bladders (ft^3):</td>
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<td>500</td>
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<td><strong>100,000</strong></td>
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## Modeling: Civil Support Inputs

### Maximum rate

<table>
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<tr>
<th>Scenario Severity</th>
<th>Low</th>
<th>Mean</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food (lbs/day):</td>
<td>125,000</td>
<td>250,000</td>
<td>375,000</td>
</tr>
<tr>
<td>Water (gal/day):</td>
<td>25,000</td>
<td>50,000</td>
<td>75,000</td>
</tr>
<tr>
<td>Water (lbs/day):</td>
<td>208,000</td>
<td>415,000</td>
<td>623,000</td>
</tr>
<tr>
<td>Other (Medical, Camp sites lbs/day):</td>
<td>81,100</td>
<td>161,000</td>
<td>241,000</td>
</tr>
<tr>
<td><strong>Total (lbs/day):</strong></td>
<td><strong>414,000</strong></td>
<td><strong>826,000</strong></td>
<td><strong>1,240,000</strong></td>
</tr>
</tbody>
</table>

### Medical

<table>
<thead>
<tr>
<th>Scenario Severity</th>
<th>Low</th>
<th>Mean</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doctors:</td>
<td>7</td>
<td>13</td>
<td>19</td>
</tr>
<tr>
<td>Nurses:</td>
<td>25</td>
<td>50</td>
<td>75</td>
</tr>
<tr>
<td>Surgeons:</td>
<td>4</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>Assistants:</td>
<td>7</td>
<td>13</td>
<td>19</td>
</tr>
<tr>
<td><strong>Total Medical Personnel:</strong></td>
<td><strong>43</strong></td>
<td><strong>83</strong></td>
<td><strong>123</strong></td>
</tr>
</tbody>
</table>

### SH-60S

<table>
<thead>
<tr>
<th>Scenario Severity</th>
<th>Low</th>
<th>Mean</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cargo Trip Time (hrs):</td>
<td>0.13</td>
<td>0.61</td>
<td>1.10</td>
</tr>
<tr>
<td>Cargo Sorties/day:</td>
<td>92</td>
<td>184</td>
<td>276</td>
</tr>
<tr>
<td>Personnel Trip Time (hrs):</td>
<td>0.24</td>
<td>0.58</td>
<td>0.92</td>
</tr>
<tr>
<td>Personnel Sorties/day:</td>
<td>3</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>Equipment Trip Time (hrs):</td>
<td>0.13</td>
<td>0.61</td>
<td>1.10</td>
</tr>
<tr>
<td>Equipment Sorties/day***:</td>
<td>7</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td><strong>Number required:</strong></td>
<td><strong>2</strong></td>
<td><strong>16</strong></td>
<td><strong>43</strong></td>
</tr>
</tbody>
</table>

### MV-22

| Cargo Trip Time (hrs): | 0.10 | 0.46 | 0.81 |
| Cargo Sorties/day:    | 42   | 83   | 124  |
| Personnel Trip Time (hrs): | 0.21 | 0.42 | 0.62 |
| Personnel Sorties/day: | 2   | 3    | 5    |
| Equipment Trip Time (hrs): | 0.10 | 0.46 | 0.81 |
| Equipment Sorties/day***: | 4   | 5    | 8    |
| **Number required:** | **1** | **5** | **13** |

### MH-53K

| Cargo Trip Time (hrs): | 0.11 | 0.51 | 0.91 |
| Cargo Sorties/day:    | 16   | 31   | 46   |
| Personnel Trip Time (hrs): | 0.23 | 0.52 | 0.81 |
| Personnel Sorties/day: | 1   | 2    | 2    |
| Equipment Trip Time (hrs): | 0.11 | 0.51 | 0.91 |
| Equipment Sorties/day***: | 4   | 5    | 8    |
| **Number required:** | **1** | **3** | **7** |
Modeling: Civil Support Inputs

**Storage**

<table>
<thead>
<tr>
<th>Food (lbs)</th>
<th>Low</th>
<th>Mean</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>313,000</td>
<td>625,000</td>
<td>938,000</td>
<td></td>
</tr>
<tr>
<td>Camp sites (lbs)</td>
<td>375,000</td>
<td>750,000</td>
<td>1,130,000</td>
</tr>
<tr>
<td>Doctors/nurses (lbs)*</td>
<td>10,500</td>
<td>19,500</td>
<td>28,500</td>
</tr>
<tr>
<td>Surgeons/assistants (lbs)</td>
<td>20,000</td>
<td>35,000</td>
<td>50,000</td>
</tr>
</tbody>
</table>

**Total (lbs):**

<table>
<thead>
<tr>
<th>Total (lbs)</th>
<th>Low</th>
<th>Mean</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>718,000</td>
<td>1,430,000</td>
<td>2,140,000</td>
<td></td>
</tr>
</tbody>
</table>

**Food (ft^3):**

<table>
<thead>
<tr>
<th>Food (ft^3)</th>
<th>Low</th>
<th>Mean</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>12,800</td>
<td>25,500</td>
<td>38,300</td>
<td></td>
</tr>
<tr>
<td>Camp sites (ft^3)**</td>
<td>19,200</td>
<td>38,400</td>
<td>57,600</td>
</tr>
<tr>
<td>Doctors/nurses (ft^3)</td>
<td>428</td>
<td>796</td>
<td>1,170</td>
</tr>
<tr>
<td>Surgeons/assistants (ft^3)</td>
<td>816</td>
<td>1,430</td>
<td>2,040</td>
</tr>
<tr>
<td>Water Bladders (ft^3)</td>
<td>168</td>
<td>334</td>
<td>500</td>
</tr>
</tbody>
</table>

**Total (ft^3):**

<table>
<thead>
<tr>
<th>Total (ft^3)</th>
<th>Low</th>
<th>Mean</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>33,400</td>
<td>66,500</td>
<td>100,000</td>
<td></td>
</tr>
</tbody>
</table>

**Scenario Severity**

<table>
<thead>
<tr>
<th>SH-60S</th>
<th>Low</th>
<th>Mean</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cargo Trip Time (hrs):</td>
<td>0.13</td>
<td>0.61</td>
<td>1.10</td>
</tr>
<tr>
<td>Cargo Sorties/day</td>
<td>92</td>
<td>184</td>
<td>276</td>
</tr>
<tr>
<td>Personnel Trip Time (hrs):</td>
<td>0.24</td>
<td>0.58</td>
<td>0.92</td>
</tr>
<tr>
<td>Personnel Sorties/day</td>
<td>3</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>Equipment Trip Time (hrs):</td>
<td>0.13</td>
<td>0.61</td>
<td>1.10</td>
</tr>
<tr>
<td>Equipment Sorties/day***</td>
<td>7</td>
<td>10</td>
<td>15</td>
</tr>
</tbody>
</table>

**Number required:**

|                | 2   | 16  | 43  |

<table>
<thead>
<tr>
<th>MV-22</th>
<th>Low</th>
<th>Mean</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cargo Trip Time (hrs):</td>
<td>0.10</td>
<td>0.46</td>
<td>0.81</td>
</tr>
<tr>
<td>Cargo Sorties/day</td>
<td>42</td>
<td>83</td>
<td>124</td>
</tr>
<tr>
<td>Personnel Trip Time (hrs):</td>
<td>0.21</td>
<td>0.42</td>
<td>0.62</td>
</tr>
<tr>
<td>Personnel Sorties/day</td>
<td>2</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Equipment Trip Time (hrs):</td>
<td>0.10</td>
<td>0.46</td>
<td>0.81</td>
</tr>
<tr>
<td>Equipment Sorties/day***</td>
<td>4</td>
<td>5</td>
<td>8</td>
</tr>
</tbody>
</table>

**Number required:**

|                | 1   | 5   | 13  |

<table>
<thead>
<tr>
<th>MH-53K</th>
<th>Low</th>
<th>Mean</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cargo Trip Time (hrs):</td>
<td>0.11</td>
<td>0.51</td>
<td>0.91</td>
</tr>
<tr>
<td>Cargo Sorties/day</td>
<td>16</td>
<td>31</td>
<td>46</td>
</tr>
<tr>
<td>Personnel Trip Time (hrs):</td>
<td>0.23</td>
<td>0.52</td>
<td>0.81</td>
</tr>
<tr>
<td>Personnel Sorties/day</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Equipment Trip Time (hrs):</td>
<td>0.11</td>
<td>0.51</td>
<td>0.91</td>
</tr>
<tr>
<td>Equipment Sorties/day***</td>
<td>4</td>
<td>5</td>
<td>8</td>
</tr>
</tbody>
</table>

**Number required:**

|                | 1   | 3   | 7   |

**Vehicle Storage**

<table>
<thead>
<tr>
<th>&quot;Vehicle&quot; Storage</th>
<th>Scenario Severity</th>
<th>Low</th>
<th>Mean</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marine Quadcon (ft^2)</td>
<td>320</td>
<td>400</td>
<td>480</td>
<td></td>
</tr>
<tr>
<td>HMMWVs (ft^2)</td>
<td>1,540</td>
<td>2,520</td>
<td>4,340</td>
<td></td>
</tr>
<tr>
<td>Floodlight Sets (ft^2)</td>
<td>180</td>
<td>300</td>
<td>480</td>
<td></td>
</tr>
<tr>
<td>Generator Sets (ft^2)</td>
<td>180</td>
<td>300</td>
<td>480</td>
<td></td>
</tr>
</tbody>
</table>

**Total (ft^2):**

<table>
<thead>
<tr>
<th>Total (ft^2)</th>
<th>Low</th>
<th>Mean</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,220</td>
<td>3,520</td>
<td>5,780</td>
<td></td>
</tr>
</tbody>
</table>

**Aircraft**

<table>
<thead>
<tr>
<th>Aircraft</th>
<th>Scenario Severity</th>
<th>Low</th>
<th>Mean</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>43 SH-60</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13 MV-22</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 MH-53</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Smuggling: CONOPS

Target

Identification Barrier

Intercept Barrier

43
- Detectors equally spaced along barrier width
- Total barrier width = 250nm
- Distance between identification and intercept barriers set at nominal range of the RQ-8B Fire Scout (110nm)
- Target start position uniformly distributed along barrier
- Target transits perpendicular to barrier axis
- Target maintains course and speed
- Detector moves back and forth along its section of barrier
- Detector start position is uniformly distributed in barrier section
Identification: Assumptions

• “Go-fast” Vessels
  – Worst case for speed evasion
  – Radar and EO/IR identification
  – Large wake more susceptible to optical detection
  – Max Speed = 80kts

• Semi-Submersible Low Profile Vessels (SSLPV)
  – Worst case for stealth evasion
  – Low profile and fiberglass construction yields little to no radar cross section (RCS)
  – EO/IR identification only
  – Max Speed = 12kts
Identification: Assumptions

- **Unmanned Aerial Vehicles**
  - EO/IR field of view (FOV) = 30deg
  - EO/IR sweep width = 5nm
  - Radar sweep width = 37.5nm
  - Speed = 92kts IAS
  - Altitude = 5,000ft MSL
  - “Cookie cutter” sweep width based on triangular lateral range curve

- **Helicopter Aircraft**
  - EO/IR FOV = 240deg
  - EO/IR sweep width = 9.6nm
  - Radar sweep width = 27.5nm
  - Speed = 60kts IAS
  - Altitude = 500ft MSL
  - “Cookie cutter” sweep width based on triangular lateral range curve
• Limiting case for UAV is SSLPV
• Limiting case for Helo is Go-Fast
• 6 Helos required on station continuously
• 7 UAVs required on station continuously
Method

- Discrete event simulation
- Transit times, on station time, and fueling time accounted for
### Assumptions
- **SH-60**: cruise speed = 146kts IAS, refuel time = 15mins, mission endurance = 3.5hrs, on station = 1.7hrs
- **RQ-8B**: cruise speed = 92kts IAS, refuel time = 15mins, on station = 5.2hrs
- 85% availability for all aircraft

### Time Event Table

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00</td>
<td>#1 on station</td>
</tr>
<tr>
<td>0.28</td>
<td>#2 on station</td>
</tr>
<tr>
<td>0.56</td>
<td>#3 on station</td>
</tr>
<tr>
<td>0.83</td>
<td>#4 on station</td>
</tr>
<tr>
<td>1.11</td>
<td>#5 on station</td>
</tr>
<tr>
<td>1.39</td>
<td>#6 on station</td>
</tr>
<tr>
<td>1.67</td>
<td>#1 off station, #7 relieves #1</td>
</tr>
<tr>
<td>1.94</td>
<td>#2 off station, #8 relieves #2</td>
</tr>
<tr>
<td>2.22</td>
<td>#3 off station, #9 relieves #3</td>
</tr>
<tr>
<td>2.50</td>
<td>#4 off station, #10 relieves #4</td>
</tr>
<tr>
<td>2.58</td>
<td>#1 lands</td>
</tr>
<tr>
<td>2.78</td>
<td>#5 off station, #11 relieves #5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00</td>
<td>#1 on station</td>
</tr>
<tr>
<td>0.74</td>
<td>#2 on station</td>
</tr>
<tr>
<td>1.49</td>
<td>#3 on station</td>
</tr>
<tr>
<td>2.23</td>
<td>#4 on station</td>
</tr>
<tr>
<td>2.98</td>
<td>#5 on station</td>
</tr>
<tr>
<td>3.72</td>
<td>#6 on station</td>
</tr>
<tr>
<td>4.47</td>
<td>#7 on station</td>
</tr>
<tr>
<td>5.21</td>
<td>#1 off station, #8 relieves #1</td>
</tr>
<tr>
<td>5.95</td>
<td>#2 off station, #9 relieves #2</td>
</tr>
<tr>
<td>6.41</td>
<td>#1 lands</td>
</tr>
<tr>
<td>6.66</td>
<td>#1 launches</td>
</tr>
<tr>
<td>6.70</td>
<td>#3 off station, #10 relieves #3</td>
</tr>
</tbody>
</table>
Results

- SH-60: Total of 17 required to maintain 6 on station continuously
- RQ-8B: Total of 12 required to maintain 7 on station continuously
Assumptions

- Interceptors equally spaced along intercept barrier width (250nm)
- Interceptor moves upon identification at identification barrier (110nm)
- Tail chase precluded
- “Intercept” is defined as closing with the target
- Interceptor must be able to launch a RHIB or be small enough to close with target
- Interceptor moves laterally on intercept barrier, perpendicular to target track
Cost Estimation
• “…using total **procurement** and **operating** costs of $1.5B (FY08 constant dollars) per annum…” –SEA-15 Project Tasking

• **Procurement Cost:** “Equal to the sum of the procurement cost for prime mission equipment, the procurement cost for support items, and the procurement cost for initial spares.”-Defense Acquisition University (DAU)

• **Operating Cost:** “Those program costs necessary to operate and maintain the capability. These costs include military personnel and Operations and Maintenance (O&M) costs.”-DAU
Procurement Cost: Sources

- U.S. General Accounting Office (GAO) Assessments of Selected Weapons Programs
- GAO Reports to Congress
- GAO Reports to Congressional Committees
- Office of the Secretary of Defense (OSD) Acquisition, Technology and Logistics (AT&L) Selected Acquisition Reports
- Congressional Reporting Service (CRS) Reports to Congress
- Defense Acquisition University (DAU) Publications
- RAND’s National Defense Research Institute Reports
- GlobalSecurity.org
O&S Cost: Sources

• Current Ships
  – Navy Visibility and Management of Operating and Support Costs online query

• Future and Foreign Ships
  – Linear regression of current ship data based on personnel and displacement
FY2008 Correction

- Yearly inflation factor computed based on historical consumer price index (CPI)
- Inflation factor added to then-year procurement dollars
- All VAMOSC queries in constant FY2008 dollars

<table>
<thead>
<tr>
<th>Class</th>
<th>Then Year Procurement</th>
<th>FY</th>
<th>Inflation Factor</th>
<th>Procurement</th>
<th>Annual O&amp;S</th>
<th>Service Life</th>
<th>Overall PO&amp;S</th>
<th>Amortized PO&amp;S</th>
</tr>
</thead>
<tbody>
<tr>
<td>DDG-51 Burke</td>
<td>$1,031,667,188</td>
<td>2001</td>
<td>1.204</td>
<td>$1,242,439,806</td>
<td>$41,951,110</td>
<td>40</td>
<td>$2,920,484,206</td>
<td>$73,012,105</td>
</tr>
</tbody>
</table>
• Assumptions
  – Entire Marine Corps is representative of force cross section
  – Selected Marine additional qualification designators (AQDs) representative of medical personnel

• AQD Selection
  – “doctor” equivalent to AQD 6FA, Field Medicine Marine Corps Medical Officer (AQD 6FA) O3-O8
  – “surgeon” equivalent to Trauma Surgeon (AQD 6CM)
  – “nurses” equivalent to general E5
  – “surgeon assistant” equivalent to Field Medical Marine Corps Medical Officer (AQD 6FA) O1-O2
Additional Supplies

• Food
  – World Food Programme standard food ration ($4.50/ration)

• Medical Supplies
  – Based on $7,000,000 worth of pharmaceutical and medical supplies delivered to Aceh Province, Indonesia assisting 1,854,876 people ($3.77/person)

• Tents
  – Based on 24sqft per person housed in 50ft square "solar system" tents ($4,027/tent)
Threat Influences

Laurie Knowles, Northrop Grumman Shipbuilding
Threats are not new to Navy experience:

• 16 most common threats were identified in 4\textsuperscript{th} Fleet AO
• Threat prevalence was ranked as low-medium-high to provide a concise assessment to the Force Structure Team
• Standard scaling laws were applied to each threat, in order to assess their impact to a Phase Zero force between 2020 and 2050
Common Threats in 4th Fleet AO

- Threat assessment of low-mean-high; average across 4th Fleet AO.

<table>
<thead>
<tr>
<th>Description of Threat</th>
<th>H-M-L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drug Smuggling</td>
<td></td>
</tr>
<tr>
<td>Natural Disasters</td>
<td></td>
</tr>
<tr>
<td>Money Laundering</td>
<td></td>
</tr>
<tr>
<td>Arms Smuggling</td>
<td></td>
</tr>
<tr>
<td>Human Trafficking</td>
<td></td>
</tr>
<tr>
<td>HIV/AIDS</td>
<td></td>
</tr>
<tr>
<td>Crime</td>
<td></td>
</tr>
<tr>
<td>Disease (other than AIDS)</td>
<td></td>
</tr>
<tr>
<td>Terror Organizations</td>
<td></td>
</tr>
<tr>
<td>Environmental Issues</td>
<td></td>
</tr>
<tr>
<td>Lack of Human Rights</td>
<td></td>
</tr>
<tr>
<td>IUU Fishing</td>
<td></td>
</tr>
<tr>
<td>Kidnapping</td>
<td></td>
</tr>
<tr>
<td>Lack of Comms Infrastructure</td>
<td></td>
</tr>
<tr>
<td>Social Instability</td>
<td></td>
</tr>
<tr>
<td>Piracy</td>
<td></td>
</tr>
</tbody>
</table>

Legend:
- Red: High Threat Prevalence
- Blue: Medium Threat Prevalence
- Yellow: Low Threat Prevalence
Threats Scaled: 2020-2050

Scaling laws were applied to predict the nature of the most common threats between 2020-2050

• Trend data was collected for each threat, if available
• Data was plotted with a trend line and a correlation coefficient was calculated
  • If the data supported a linear correlation the threat was projected using a linear trend
  • If the data showed no linear relationship, patterns were used
  • If no linear relationship or other patterns were revealed, underlying causal factors were used
Scaling Results

Drug Smuggling

\[ r = 0.701 \]
No linear trend
No clear patterns
Focus on causal factors

Natural Disasters

\[ r = 0.931 \]
Linear trend – slope \( \sim +10 \text{/yr} \)
Re-run with intervention improvement factor (10%/decade)
Anticipate between 910-1040 events in 2050 (17% in 4th Fleet AO)
Deriving the Phase Zero Force

LT James Smith
Requirements

Phase 0 Force Requirements

Threat Analysis

Modeling

Cost

History / Research
• Consolidate current and future ship capabilities
• In conjunction with modeling team:
  – Develop mission scenarios
  – Develop mission requirements
  – Develop cost data for all current and future ships
• Perform a gap analysis for Partnership of the Americas 2007 against requirements developed during modeling and develop lessons learned that can aid in the force selection process
• Develop current and future force structures that can meet all requirements for the lowest cost
  – Construct three possible force configurations, corresponding to mission severity (low, mean, high) using only current ships
  – Construct three possible force configurations, corresponding to mission severity using a mix of current and future ship
  – Develop a recommended current and future force

• Compare the recommended current and future force and select a single force best suited to perform regional phase zero operations
### Mission Requirements

<table>
<thead>
<tr>
<th>Scenario Severity</th>
<th>Low</th>
<th>Mean</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number affected:</td>
<td>50,000</td>
<td>100,000</td>
<td>150,000</td>
</tr>
<tr>
<td>Number injured:</td>
<td>2,500</td>
<td>5,000</td>
<td>7,500</td>
</tr>
<tr>
<td>Penetration:</td>
<td>0</td>
<td>25</td>
<td>50</td>
</tr>
<tr>
<td>Storage Requirement (ft$^3$):</td>
<td>33,400</td>
<td>66,500</td>
<td>99,600</td>
</tr>
<tr>
<td>Vehical Storage Requirement (ft$^2$):</td>
<td>2,080</td>
<td>3,880</td>
<td>6,080</td>
</tr>
<tr>
<td>Water (gal/day):</td>
<td>25,000</td>
<td>50,000</td>
<td>75,000</td>
</tr>
<tr>
<td>Marines Required:</td>
<td>115</td>
<td>276</td>
<td>368</td>
</tr>
<tr>
<td>Total Medical Personnel:</td>
<td>43</td>
<td>83</td>
<td>123</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scenario Severity</th>
<th>Low</th>
<th>Mean</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>SH-60's required:</td>
<td>2</td>
<td>17</td>
<td>43</td>
</tr>
<tr>
<td>MV-22's required:</td>
<td>1</td>
<td>5</td>
<td>13</td>
</tr>
<tr>
<td>CH-53's required:</td>
<td>1</td>
<td>3</td>
<td>7</td>
</tr>
</tbody>
</table>

**Anti-Smuggling Mission SH-60 required** 17
• Partnership of the Americas 2007 consisted of the following force:
  – USS Pearl Harbor (LSD 52)
    • Units of 24th Marine Regiment and Assault Craft Unit 1
  – USS Mitscher (DDG 57)
  – USS Samuel B Roberts (FFG 58)
    • (2) SH-60 from HSL 48
  – Chilean frigate Almirante Latorre (FFG 14)
    • (1)SH-32 “Super Puma”.
• POA 2007 annual cost: $264 million
<table>
<thead>
<tr>
<th>Requirement</th>
<th>Required</th>
<th>Available</th>
<th>Deficit</th>
<th>Requirement Met</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cargo Capacity</td>
<td>99500 ft³</td>
<td>40600 ft³</td>
<td>59000 ft³</td>
<td>40.7%</td>
</tr>
<tr>
<td>Aircraft Lift Capacity</td>
<td>1240000 lbs/day</td>
<td>60300 lbs/day</td>
<td>1180000 lbs/day</td>
<td>4.9%</td>
</tr>
<tr>
<td>Water Production capacity</td>
<td>75000 gal</td>
<td>61400 gal</td>
<td>13600 gal</td>
<td>81.9%</td>
</tr>
</tbody>
</table>

### High Severity Civil Support Mission Requirement Gap

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Required</th>
<th>Available</th>
<th>Deficit</th>
<th>Requirement Met</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cargo Capacity</td>
<td>66500 ft³</td>
<td>40600 ft³</td>
<td>25900 ft³</td>
<td>61.0%</td>
</tr>
<tr>
<td>Aircraft Lift Capacity</td>
<td>826000 lbs/day</td>
<td>132000 lbs/day</td>
<td>694000 lbs/day</td>
<td>16.0%</td>
</tr>
<tr>
<td>Water Production capacity</td>
<td>50000 gal</td>
<td>61400 gal</td>
<td>-11400 gal</td>
<td>123%</td>
</tr>
</tbody>
</table>

### Mean Severity Civil Support Mission Requirement Gap

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Required</th>
<th>Available</th>
<th>Deficit</th>
<th>Requirement Met</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cargo Capacity</td>
<td>33400 ft³</td>
<td>40600 ft³</td>
<td>-7200 ft³</td>
<td>122%</td>
</tr>
<tr>
<td>Aircraft Lift Capacity</td>
<td>414000 lbs/day</td>
<td>623000 lbs/day</td>
<td>-209000 lbs/day</td>
<td>151%</td>
</tr>
<tr>
<td>Water Production capacity</td>
<td>25000 gal</td>
<td>61400 gal</td>
<td>-36400 gal</td>
<td>246%</td>
</tr>
</tbody>
</table>

### Low Severity Civil Support Mission Requirement Gap
• POA 2007 would only be able to meet the requirements of the low severity Civil Support mission. The limiting requirement was primarily airlift.

• POA 2007 could not meet anti-smuggling mission requirements. The limiting requirement was primarily number of aircraft required.

• DDG annual cost is ~$13 million more than FFG with little additional benefit in phase zero operations.
Force based on the following assumptions:

- Will only be required to perform Civil Support mission or Anti-smuggling mission at a given time
- Force must meet all mission requirements
- LCS and JHSV are considered to be future ships
- Total annual cost of the force will be for procurement and operating costs of the ships and aircraft
- Must have at least one heavy lift helicopter in force
- Must have at least one SH-60 in force
Current Force Selection (High)

- Force selection driven by four key factors:
  - Cargo capacity required
  - Airlift capacity required for Civil Support mission
  - Number of air assets required for Anti-smuggling mission
  - Number of intercept ships required

- Forces Selected
  - LHD 1 class
    - (5) CH-53
    - (11) SH-60B
  - (3) FFG 7 class
    - (6) SH-60B
## Current force (High) Capabilities

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Requirement</th>
<th>Capability</th>
<th>Fulfillment rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage Requirement (ft³):</td>
<td>99,600</td>
<td>109,000</td>
<td>109%</td>
</tr>
<tr>
<td>Vehicle Storage Requirement (ft²):</td>
<td>6,080</td>
<td>20,900</td>
<td>344%</td>
</tr>
<tr>
<td>Water production (gal/day):</td>
<td>75,000</td>
<td>132,000</td>
<td>176%</td>
</tr>
<tr>
<td>Medical/Marine personnel</td>
<td>491</td>
<td>1690</td>
<td>343%</td>
</tr>
<tr>
<td>Airlift capability:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(lbs/day):</td>
<td>1,240,000</td>
<td>1,634,000</td>
<td>132%</td>
</tr>
<tr>
<td>Personnel/day:</td>
<td>99</td>
<td>99</td>
<td>100%</td>
</tr>
<tr>
<td>Equipment/day:</td>
<td>16</td>
<td>16</td>
<td>100%</td>
</tr>
<tr>
<td>SH-60 required for Anti-smuggling</td>
<td>17</td>
<td>17</td>
<td>100%</td>
</tr>
</tbody>
</table>

Annualized cost: $432 million
Future Force Selection

Force based on the following assumptions:

- Platforms currently built by other nations may be selected.
- If platform is currently produced in another nation it can be produced in the U.S. for approximately the same cost.
- Platform must be capable of being produced and fielded by 2020.
- All assumptions from current force selection in effect.
Future Force (High)

• Force selection driven by four key factors:
  – Cargo capacity required
  – Airlift capacity required for Civil Support mission
  – Air assets required for Anti-smuggling mission
  – Number of intercept ships required

• Forces Selected:
  – JMSDF DDH
    (7) CH-53K
    (6) RQ-8
  – LPD-17
    (2) SH-60
    (3) RQ-8
    (2) M-80 Stiletto
  - JHSV
  - Visby
    (3) RQ-8

Annual Cost: $305 million
JMSDF DDH

- Displacement: 20,000 tons
- Speed: 30+ kts
- Draft: 22 ft
- Crew: 371
- Sonar: Bow mounted

- Aircraft: Up to 8 CH-53K
- Weapons: 16 Cell VLS
- Sonar: Bow mounted
- Radar: FCS-3
- 2 Phalanx CIWS
- OPS-20
- Displacement: 25,000 tons
- Speed: 22 kts
- Draft: 22 ft
- Crew: 352
- Well Deck: 188 x 50 x 31

- Aircraft: 2CH-53K or 4SH-60
- Storage: 25,000 ft³ Cargo
  25,000 ft² Vehicle
- Troops: 700
- Displacement: 1900 tons
- Speed: 35 kts full load
- Draft: 13 ft
- Crew: 30

- Aircraft: 2SH-60 spots
- Storage: 28,740 ft² Vehicle
- Reconfigurable mission deck
Visby

- Displacement: 1500 tons
- Speed: 35+ kts
- Draft: 9.5 ft
- Crew: 43
- Sonar: Towed array

- Aircraft: 1 SH-60 or 3 RQ-8
- Weapons: 57mm gun
- Sonar: Towed array
- Radar: Air search, Surface search and fire control
- Anti-ship missiles
M-80 Stiletto

• Displacement: 45 tons
• Speed: 50 kts
• Draft: 3 ft
• Crew: 3

• Aircraft: UAV capable
• 88 ft long 40ft wide 18.5 high
• Cargo capacity: 20 tons, 1900 ft²
• Organic 7m RHIB
• Cruise speed: 125+ mph
• Endurance: 8 hours
• Service ceiling: 20,000 ft
• Three spot in one SH-60 spot
## Future Force (High) Capabilities

### Annualized cost: $305 million

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Requirement</th>
<th>Capability</th>
<th>Fulfillment rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage Requirement (ft³):</td>
<td>99,600</td>
<td>100,000</td>
<td>100%</td>
</tr>
<tr>
<td>Vehicle Storage Requirement (ft²):</td>
<td>6,080</td>
<td>28,300</td>
<td>465%</td>
</tr>
<tr>
<td>Water production(gal/day):</td>
<td>75,000</td>
<td>77,500</td>
<td>103%</td>
</tr>
<tr>
<td>Medical/Marine personnel</td>
<td>491</td>
<td>880</td>
<td>179%</td>
</tr>
<tr>
<td>Airlift capability:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(lbs/day):</td>
<td>1,240,000</td>
<td>1,670,000</td>
<td>135%</td>
</tr>
<tr>
<td>Personnel/day:</td>
<td>99</td>
<td>99</td>
<td>100%</td>
</tr>
<tr>
<td>Equipment/day:</td>
<td>16</td>
<td>16</td>
<td>100%</td>
</tr>
<tr>
<td>RQ-8 required for Anti-smuggling</td>
<td>12</td>
<td>12</td>
<td>100%</td>
</tr>
</tbody>
</table>
Current vs. Future

• Both Current and Future force meet all mission requirements

• Current and Future force have approximately equal cargo and vehicle space

• Current force has more medical facilities onboard and greater troop carrying ability

• Future force is scalable and flexible and will be able to transition between phases of operations easily

• The future force has a smaller logistical footprint
  – current force needs to be refueled/resupplied every 3 days
  – future force can last 7 days between resupply.

• Future force accomplishes the same mission for $305 million vice $432 million and savings of $127 million or ~30%
Regional Stability

LT Chet Lee
Measures of Stability

• Failed State Index
  – Foreign Policy Journal

• United Nations Development Programme (UNDP) Early Warning Report
  – United Nations Report

• Country Policy and Institutional Assessment
  – World Bank Study

• Political Risk Services
  – Political Risk Services Group
Measures of Stability

• Program on the Geopolitical Implications of Globalization and Transnational Security
  – Combines many of the other indexes
  – Over 250 indicators that are measured by reputable sources internationally
  – Indicators are lagging
  – 18 month window to detect effectiveness
• Societal sector
• Political sector
• Economic stability
• Environment
• Military and security
• Direct effect on 45 factors
  – May be measurable in the short term
  – Example
    • Crime rate
    • Regional conflicts

• Indirect effect on many factors
  – Example
    • The Anti-smuggling mission can reduce black market transactions which, in turn, increases GDP
## Effects on Stability

<table>
<thead>
<tr>
<th>(Broad Sector) Variables</th>
<th>Freedom of Navigation</th>
<th>Relation With local govt</th>
<th>Training Local forces</th>
<th>Equipping</th>
<th>Info-sharing</th>
<th>Anti-terrorism</th>
<th>Anti-Piracy</th>
<th>Anti-illegal fishing</th>
<th>Restoration Critical Infra</th>
<th>Life-sustenance</th>
<th>Force Protection</th>
<th>Non Combat Evacuation</th>
<th>Anti-smuggling</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>(Economy)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black Market</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Living Standard</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Conflict Induce Poverty</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td><strong>(Environmental)</strong></td>
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<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Natural Disasters</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Natural Resource Dispute</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
Future Studies
• A more detailed analysis of the additional 10 missions
• A more in depth study of Phase Zero effects on stability
• Measures of effectiveness for a Phase Zero force
• Integration of command and control with Coalition partners
• Maritime Phase Zero force structures
• 13 missions of maritime Phase Zero
• Phase Zero missions projected to 2020 through 2050
• Phase Zero triangle
• Critical platform capabilities needed to accomplish the maritime Phase Zero mission
• Tailored command and control architecture
Break out Schedule

Bullard 100 Computer Lab 1230

- Background/Stability (RM A)
- Force Structure/Modeling/Cost Analysis (RM B)
- Threat Team (RM C)

If you would like a copy of the brief and the final paper, please provide LT Chet Lee with your mailing address