Commanding the Seas:
Reinvigorating U.S. Navy Surface Warfare
Overview

- Challenges and opportunities
- Trends to address
- New concepts for:
  - Offensive sea control
  - Sea-based AAW
  - Weapons development
  - Increasing offensive sea control capacity
  - Addressing defensive and constabulary missions
- Capability and program implications
• In 2001, the Navy planned a new surface warfare approach
  – New family of CG(X), DD(X), LCS
  – Employing “Network-centric warfare”
  – All three ships now cancelled/truncated

• Navy has an opportunity to implement new surface warfare concept
  – Final specifications for Flight III DDG-51
  – Concept and design of follow-on SSC and modifications to LCS
  – Phased modernization of remaining CGs
  – New weapons and sensors

• This study proposes a plan focused on:
  – Large and small surface combatants
  – Results possible by mid-2020s
Trends to Address
China the “pacing challenge” but not the only, or most likely, A2/AD threat the surface forces will face.
Iran shows less capable militaries can combine geography and “fire and forget” weapons in effective A2/AD network.
Proxy, paramilitary, and indirect conflicts on the rise
Budgets unlikely to rise; pressure continues on R&D and procurement
New Surface Fleet Concepts & Programmatic Implications
Cold War “Outer Air Battle”

– Enabled carriers to approach within striking distance of Russia
– Surface fleet’s contribution was “Up, Out and Down”
– Ships & aircraft able to engage Soviet bombers outside anti-ship missile range
Surface-Launched Missile Threat to U.S. Surface Combatants

Naval Strike Missile range from IHS Jane’s Navy International. All other ranges from IHS Jane’s Defence: Weapons database.

* RGM-84L, a Harpoon Block II variant, is the only variant in service with the U.S. Navy.
** Extended-range Harpoon Block I variant previously in U.S. and foreign service.
- Surface combatants will conduct bulk of sea control
  - Subs, carriers, amphibious ships conducting power projection in future scenarios
- Defeat enemy weapon launchers, not just enemy weapons
### Limits of Sea-Based AAW

<table>
<thead>
<tr>
<th>Mission</th>
<th>Missile</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long-range Defensive AAW</td>
<td>SM-6</td>
<td>16</td>
</tr>
<tr>
<td>Mid-range Defensive AAW</td>
<td>SM-2</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>ESSM</td>
<td>32 (8 cells)</td>
</tr>
<tr>
<td>BMD</td>
<td>SM-3</td>
<td>6</td>
</tr>
<tr>
<td>Strike</td>
<td>Tomahawk</td>
<td>24</td>
</tr>
<tr>
<td>SUW</td>
<td>Harpoon</td>
<td>8 non-VLS</td>
</tr>
<tr>
<td>ASW</td>
<td>VLA</td>
<td>10</td>
</tr>
</tbody>
</table>

![Graph showing successful engagements vs. defending missile single shot probability](image-url)
• Shift to a single, dense defensive AAW layer
  – Smaller interceptors; just as capable and more numerous as longer range
  – Acknowledges challenges against OTH targets
  – Enables integration of lasers, railgun and electronic warfare

• Long-range interceptors used for offensive AAW
- Laser on some Flight III DDG-51
  - 300-500 kW able to conduct air defense
  - Needed power and cooling (~1500 kW) too high for other ships
  - Smaller laser (~60-100 kW) could be used for counter-ISR, counter-UAV

- EM railgun on JHSV, DDG-1000
  - 32 MJ able to conduct air defense, strike
  - Power requirement of 17 MW
  - 64 MJ EMRG on DDG-1000 for strike

- Shift defensive AAW to ~30 nm range
  - Smaller ESSM-like interceptor
  - EW systems
  - Laser
  - Electromagnetic railgun
More capacity needed from each VLS cell

Emphasize:
- relevant capability
- multi-mission applicability
- smaller size; > 1 per cell

Planned solutions are large, single-mission weapons

No ASW weapon able to outrange sub-launched anti-ship missiles

Getting the most out of the ship’s main battery – the VLS magazine
### Weapons Program Implications

<table>
<thead>
<tr>
<th>Mission</th>
<th>Current Missile</th>
<th>Number</th>
<th>Future Missile</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offensive AAW</td>
<td>SM-6</td>
<td>16</td>
<td>SM-6</td>
<td>42</td>
</tr>
<tr>
<td>Defensive AAW</td>
<td>SM-2</td>
<td>32</td>
<td>ESSM Blk II</td>
<td>96 (24 cells)</td>
</tr>
<tr>
<td></td>
<td>ESSM</td>
<td>32 (8 cells)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMD</td>
<td>SM-3</td>
<td>6</td>
<td>SM-3</td>
<td>4</td>
</tr>
<tr>
<td>Strike</td>
<td>Tomahawk</td>
<td>24</td>
<td>LRASM</td>
<td>18</td>
</tr>
<tr>
<td>SUW</td>
<td>Harpoon</td>
<td>8 non-VLS</td>
<td>LRASM / SM</td>
<td>18/42</td>
</tr>
<tr>
<td>ASW</td>
<td>VLA</td>
<td>10</td>
<td>New ASW Missile</td>
<td>8</td>
</tr>
</tbody>
</table>

- **Multi-mission LRASM**
- **Long-range ASROC**
- **SM-6 for offense**
- **ESSM for defense**
Cruiser phased modernization needed for offensive sea control, air defense commander capacity
Cruiser phased modernization needed for offensive sea control, air defense

Iwakuni Naval Air Station
Sasebo Naval Base
Tokyo
THAAD Batteries
PAC-3 Batteries

Aegis Ashore Sites (provide regional BMD)

Shore-based BMD systems should replace BMD ships in defense of fixed locations overseas
Enabling small surface combatants able to contribute to offensive sea control with CGs and DDGs or on their own.
Growing SSC shortfall requires new approaches to escort, training and security missions so CGs and DDGs can focus on offense.
### LCS Procurement

<table>
<thead>
<tr>
<th>Year</th>
<th>FY05</th>
<th>FY06</th>
<th>FY07</th>
<th>FY08</th>
<th>FY09</th>
<th>FY10</th>
<th>FY11</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>FY11</th>
<th>FY12</th>
<th>FY13</th>
<th>FY14</th>
<th>FY15</th>
<th>FY16</th>
<th>FY17</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

### Follow-on SSC Procurement

<table>
<thead>
<tr>
<th>Year</th>
<th>FY19</th>
<th>FY20</th>
<th>FY21</th>
<th>FY22</th>
<th>FY23</th>
<th>FY24</th>
<th>FY25</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

- Modify LCS to be the follow-on SSC
  - Only one variant
- Equip for defensive AAW, ASW and SUW missions
  - VLS (24 cell)
  - 3D radar (not SPY)
  - ASW mission package
  - Same gun
- Upgrade selected LCS with VLS
**Program Implications – Defensive & Constabulary Missions**

**Shift LCS to dedicated crews; base some in today’s overseas SSC ports**

<table>
<thead>
<tr>
<th>LCS 1</th>
<th>LCS 3</th>
<th>LCS 1</th>
<th>LCS 3</th>
<th>LCS 1</th>
<th>LCS 3</th>
<th>LCS 1</th>
<th>LCS 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deployed</td>
<td>Homeport</td>
<td>Deployed</td>
<td>Homeport</td>
<td>Deployed</td>
<td>Homeport</td>
<td>Deployed</td>
<td>Homeport</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Crew 101</th>
<th>LCS 1</th>
<th>Off Hull</th>
<th>LCS 3</th>
<th>LCS 1</th>
<th>Off Hull</th>
<th>LCS 3</th>
<th>LCS 1</th>
<th>Off Hull</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crew 102</td>
<td>Off Hull</td>
<td>LCS 3</td>
<td>LCS 1</td>
<td>Off Hull</td>
<td>LCS 3</td>
<td>LCS 1</td>
<td>Off Hull</td>
<td>LCS 3</td>
</tr>
<tr>
<td>Crew 103</td>
<td>LCS 3</td>
<td>LCS 1</td>
<td>Off Hull</td>
<td>LCS 3</td>
<td>LCS 1</td>
<td>Off Hull</td>
<td>LCS 3</td>
<td>LCS 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LCS forward</th>
<th>Deployed</th>
<th>Homeport</th>
</tr>
</thead>
<tbody>
<tr>
<td>60-120 days</td>
<td>30 days</td>
<td></td>
</tr>
<tr>
<td>LCS CONUS</td>
<td>120-210 days</td>
<td>180 days</td>
</tr>
</tbody>
</table>
• Separate mission packages from LCS program
  – Whole MCM mission package
  – Whole SUW mission package
  – Parts of ASW mission package

• Add new mission packages
  – Electronic warfare
  – Humanitarian assistance
  – Maritime security

• Consider expanding non-combatant fleet
  – Less expensive option for some operations in low-threat environments
Challenges demand a new approach to surface warfare
- Networked family of CG(X), DD(X), LCS no longer viable
- Access threats increasing defensive demands on all surface combatants
- Instability will increase demands for training, cooperation and security
- Budgets will preclude new designed until 2030s

Navy has opportunity to implement a new surface fleet concept
- Flight III DDG-51
- Follow-on SSC and modifications to LCS
- Phased modernization of CGs
- New weapons and sensors (LRASM, AMDR variants, ESSM Block II, SEWIP)
- Potential of the National Fleet

Surface fleet must refocus on offensive sea control
- CGs and DDGs equipped and available to defeat enemy platforms
- Restore ability of SSCs to do escort, training and constabulary missions

Restoring the surface fleet’s ability to gain sea control, protect non-combatant ships, train allies and partners, and secure sea lanes