DDG 51 Program

Presented to:
Surface Navy Association

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Presented by:
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DISTRIBUTION STATEMENT A:
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Agenda

• DDG 51 Shipbuilding Profile
• DDG 113-116 Status
• Flight III Update
• Rapid Reconfigurable Spaces
• Commonality
• Flight III Design / Cost / Capability Trade-offs
• Flight IIA – Flight III Service Life Allowance Comparison
• Summary
DDG 51 Class Shipbuilding Profile (PB14)

ACQUISITION STRATEGIES

- Competition For Work: 27
- Negotiated Allocation: 7
- Competition for Profit (PRO): 8
- Multi-Year (PRO): 44
- Total: 86

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DDG 113-116 Status
(Through Nov 2013)

• DDG 113 (HII) Launch scheduled for 9 Jan 15 (25% complete)

• DDG 114 (HII) Lay Keel scheduled for 21 Jul 14 (3% complete)

• DDG 115 (BIW) Lay Keel scheduled for 18 May 14 (37% complete)

• DDG 116 (BIW) Lay Keel scheduled for 5 Apr 15 (13% complete)
Flight III Status / Way Ahead

• Completed 2\textsuperscript{nd} year of Flight III Study on 17 Sep 12

• Preliminary Design development started May 2012; completion planned for Apr 2014

• Gate 2 completed 24 Jul 12

• Gate 3 completed 26 Oct 12
  – CDD and CONOPS Joint staffing underway

• Draft Engineering Change Proposals (ECPs) currently being developed to reflect Flight III modifications

• Gate 4-5 / Configuration Steering Board (CSB) planned for 2\textsuperscript{nd} Q FY14

• DAB-PR planned for 3\textsuperscript{rd} Q FY14 to support Flight III ECP RFP release
Primary Flight III Changes

**Enclosures**
- Added starboard enclosures and stacked boats for displaced equip & stores

**AMDR-S**
- Replacing AN/SPY-1D(V)

**AC Plant**
- 5 x 300 Ton HES/C AC Plants
  - Replacing 5 x 200 Ton AC Plants

**Electric Plant**
- 3 x 4MW, 4160 VAC SSGTGs replacing 3 x 3MW, 450 VAC SSGTGs
- Add transformers, PCM, modified switchgear
- Modified controls for MCS and MFM

**ACB Next / TI Next Upgrade to AWS**
- Obsolescence and roll-down impact changes as required
What makes a ship “good”?

Every art and every inquiry, and similarly every action and technology, is thought to aim at some good; and for this reason *the good has rightly been declared to be that at which all things aim* ... now, as there are many arts and sciences, their ends also are many; the end of the medical art is health, *that of shipbuilding a vessel*, that of strategy victory, that of economics wealth.

**Deficiency (-)**  (Vice)
- Cowardice
- Self-indulgence
- Indecisiveness

**Balance**  (Virtue)
- COURAGE
- TEMPERANCE
- SELF CONTROL

**Excess (+)**  (Vice)
- Rashness
- Insensibility
- Impulsiveness

**Shipbuilding**
- Malleable
- Proprietary
- Cost
- RECONFIGURABLE
- COMMONALITY
- AFFORDABILITY
- Survivable
- Unconstrained
- Performance

“It is best to rise from life as from a banquet, neither thirsty nor drunken”
Rapidly Reconfigurable Spaces – Background

• To achieve survivability and redundancy requirements, DDG 51 Combat Systems spaces disbursed throughout ship close to centerline
  – Results in high depot level mid-life upgrade costs
    ▪ Current equipment removal routes are designed for in-service maintenance and replacement
    ▪ Labor intensive; require highly coordinated logistics to move equipment through doors, hatches, ladder ways, etc.

• Rapid Removal Routes being developed to significantly increase efficiency and reduce cost of unloading and load out of Combat Systems equipment during mid-life upgrade
  – Utilizes pre-designed “openings” in ships structure
  – Designed with least impact to existing equipment locations
Rapid Reconfigurable Space – Improved Access

WAS

Passages crowded with piping and cabling

IS

Pre-defined routes allow for clean cutting of shell
Nominally 12 ft x 8 ft

Use of shell cut and portable equipment
removal rail system to rapidly reconfigure space

Pre-defined removal route to avoid cutting of piping and electrical systems
Improved Planned Shell Cuts
Typical Detail - WERP

Pre-defined routes allow for clean cutting of shell
Nominally 12 ft x 8 ft

Routes are located in areas to minimize impacts and rework to piping and electrical systems

Use of shell cut and portable equipment removal rail system to rapidly reconfigure space
Improved Planned Shell Cuts – Pre-Defined Spaces

Rapidly Reconfigurable Spaces with Pre-Defined Exit Paths
1) SSES (01-130-2-C)
2) CIC (1-126-0-C)
3) CSER 3 (1-300-0-C)
4) Sonar Control Room (2-50-2-C)
5) CSER 1 (2-53-1-C)
6) Communication Center (2-126-1-C)
7) CSER 2 (2-126-2-C)

Blue represents planned WERP shell cuts for equipment removal above waterline.
ACB Commonality

- Advanced Capability Build (ACB) provides Network-Based Open Architecture
  - Enhances combat system expandability and dependability based on Common Equipment Library or Common Building Blocks
  - Allows Common Computing / Display Infrastructure for Surface Combat Systems
    - SSDS / Aegis migrating towards common equipment (i.e. SSDS adopting common rail-mounting standard designed by Aegis within SSDS)
      - Uses common set of COTS electronic components
      - FY 12 & 13 - SSDS participated in Aegis-led effort to select COTS components contributing to formal Aegis SETR reviews
TI 16 Equipment Suite
Common Component Building Blocks

Tactical Server Chassis
IPMI Dual Star Bus
SNMP On Line

Tactical Server

Tactical Switch

Core Switch
SNMP

Edge Switch
SNMP

VMEmbus Chassis
Legacy ORTS Bus
SBCs – SNMP

Storage Controller and Expansion
SNMP

DC Power Distro
SNMP

IP Power Control
Polled Serial Status

Remote Access Server
SNMP

System Monitor
SNMP

3U Server
IPMI
SNMP On Line

1U Server
IPMI
SNMP On-Line

Remote Access Server
SNMP

System Monitor
SNMP

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<th>Concepts</th>
<th>Baseline</th>
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<th>B*</th>
<th>C*</th>
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<tr>
<td>Fiscal Year Start</td>
<td>FY16 12</td>
<td>FY16 12</td>
<td>FY24** 10</td>
<td>FY24** 10</td>
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<td>Number of Ships</td>
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<td>12</td>
<td>10</td>
<td>10</td>
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<td>S – Band dB</td>
<td>SPY +15</td>
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<td>X – Band System</td>
<td>SPQ-9B</td>
<td>SPQ-9B</td>
<td>AMDR-X</td>
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<td>Power Architecture</td>
<td>3x3MW 450 VAC</td>
<td>3x4MW 4160 VAC</td>
<td>3x4MW 4160 VAC</td>
<td>4x4MW 4160 VAC</td>
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<tr>
<td>Electrical SLA (%)</td>
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<td>Electrical kW remaining</td>
<td>245</td>
<td>2,145</td>
<td>828</td>
<td>4,628</td>
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<td>Full Load Displacement (LT)</td>
<td>9,467</td>
<td>9,558</td>
<td>9,714 #</td>
<td>9,794 #</td>
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<td>Fuel Usage (bbl/yr)</td>
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<td>103,563</td>
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<td>Fuel Use ∆ IIA (%)</td>
<td>5.7%</td>
<td>7.3%</td>
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<td>300T AC Units</td>
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<td>Percent Touched</td>
<td>22%</td>
<td>28%</td>
<td>29%</td>
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</tbody>
</table>

* Historical data; does not represent current design maturity. Feasibility of each concept subject to additional study.
** Notional FY
# with 75 LT ballast
Notes:

1. Flight III data as of Dec 2013. DDG 113 values are based on vendor data; Flight III values are projections based on Not to Exceed Estimates.
2. Power & Cooling SLAs calculated relative to Connected Load.
3. DDG 112 is based on build up from DDG 108 inclining. DDG 113 was developed during MYP Ship Impact Assessment. Flight III KG based on PD1 Full Load Displacement estimate that contains 0.49 ft KG margin that may be consumed throughout design and construction.
4. DDG 113 KG projection based on margin consumption evaluated during DDG 108 inclining.
Summary

• DDG 51 Program Restart, 13 ships under contract; DDG 113-116 in construction

• FY13-17 MYP Contract Awarded for 9 ships with option for 10th ship

• Additional trade-offs and engineering changes being evaluated for Flight III

• Gate 4 / 5 and CSB to be conducted

• DAB – PR to support authorization of release of Flight III ECP RFP