Testing and Training Challenges for the Evolutionary Aircraft Carrier Strategy

by

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Aviation Program Officer
The Technical Complexity of CVNX

Design effort estimated at 45 million man-hours!

<table>
<thead>
<tr>
<th>Parts Modeled</th>
<th>Surfaces Modeled</th>
<th>Disk Storage</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVNX</td>
<td>1024 K</td>
<td>146 M</td>
</tr>
<tr>
<td>NSSN</td>
<td>370 K</td>
<td>50 M</td>
</tr>
<tr>
<td>F-22</td>
<td>16 K</td>
<td>2 M</td>
</tr>
<tr>
<td>777</td>
<td>100 K</td>
<td>14 M</td>
</tr>
<tr>
<td>Auto</td>
<td>7 K</td>
<td>1 M</td>
</tr>
</tbody>
</table>

CVNX 1
1,695 Ft.

New Attack Submarine (NSSN)
1,075 Ft.

F-22 Fighter Aircraft
325 Ft.

Washington Monument
556 Ft.

Boeing 777
75 Ft.

Automobile
12 Ft.

Equivalent Number of 1.4 MB Floppy Disks
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1,150 7,150 31,300 103,600 162,500
Departmental Guidance

- DoDINST 5000.2R, Section 4.3 “Systems Engineering”
  - “Requirements Analysis. Throughout the acquisition process the program office shall work with the user to establish and refine operational and design requirements that result in the proper balance between performance and cost within affordability constraints. Requirements analysis shall be conducted iteratively with functional analysis ... to develop and refine functional and performance requirements, external interfaces and provide traceability among user requirements and design requirements.”

<table>
<thead>
<tr>
<th>Mission Needs Statement (MNS)</th>
<th>Operational Requirements Document (ORD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>2000</td>
</tr>
</tbody>
</table>

- High volume firepower
- Mobility
- Sustainability
- Survivability
- Joint C2
- Flexibility and growth potential

OPNAV responsible for requirements

PMS-378 develops requirements with Fleet(User) Input/Review

Net: Affordable ORD Performance spec

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PEO Aircraft Carriers
Development Strategy

- Phased Approach - “Transition Ships”
  - CVN 77: CVN 76 + new combat system + TOC savings
  - CVNX 1: CVN 77 + new propulsion & electrical system + TOC savings
  - CVNX 2: CVNX 1 + state-of-the-art flight deck + hull improvements + TOC savings
- Design for flexibility
  - Upgrades over 50-year life
- Share development ideas, risk & cost with other programs (T&T results)
  - Horizontal integration of combat systems
- New acquisition methods... encourage innovation
  - IPPD
  - Subcontracting arrangements
  - Performance-based specs
  - COTS technology & procedures
- Link with Smart Carrier to provide backfit wherever possible
Evolutionary Concept

TOC Savings / Capability

CVN 77

- $ R&D
- $ SCN
- $ TOC Savings
  550 Sailor Reduction

CVNX 1

- $ R&D
- $ SCN
- $ TOC Savings
  900 Sailor Reduction

CVNX 2

- $ R&D
- $ SCN
- $ TOC Savings
  1200-1500 Sailor Reduction

Resource Constraint

Integrated Combat Systems
Active Planar Arrays
Improved Self-Defense

New Propulsion

EMALS
New Electrical Power & Distribution Systems
New Functional Arrangements

EARS
Improved Hull
Survivability Improvements
State-of-the-Art Flight Deck

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07/24/2000

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Integrated $C^4$ Centers
Think Aggressively…..Act Cautiously

◆ Cost reduction initiatives include reducing manning by performing tasks better (cheaper and more reliably).
  - Focus is on communication systems, remote sensors, procedural improvements
  - Blend of onboard data bases with “Dial Up” access for support as needed.

BUT…..

◆ The Fleet is experiencing low manpower today.
  - How to test/validate reduced manning scenarios?
  - Working with the test community to use M&S that can build confidence of all parties
A Flexible Approach is Needed

- Obtain synergy from efforts such as **Smart Carrier** by involving test community with modification experiments to existing processes and systems.

- Early involvement with the test community may be able to identify operational training deficiencies and get the necessary steps underway to correct as the ship is being constructed.
  - Aircraft Carrier build period exceeds 7 years
  - Flexible test philosophy needed to address changes without "excess impact"
Training Challenges

- Training pipeline stressed to deliver quantity and quality into a dynamic systems environment
  - Long pipelines lead to late arrivals, high costs
  - In Situ training value is high, but requires foundation to be in place.
  - Schoolhouse costs driving to move some foundational training to fleet units.
- Training Strategy must be agile to satisfy both existing and new design platforms.
  - Seeking to minimize platform unique overhead
Training Issues Afloat

- Indoctrination, Qualification, Proficiency
  - Which go to sea? All Three!

- Visual trainers for aircrew now cheaper, smaller, with high fidelity presentations.
  - Re-programmable for multiple aircraft
  - Mission rehearsal now achievable

- Reduced personnel dictate new solutions beyond NEC/ MOS for all embarked systems. Cross-rate training
Summary

- Evolutionary change across Carrier Line presents an opportunity for a fresh approach.
- Longevity of platform presents some “unknown engineering” that may not have adequate M&S tools verified and accredited.
- “Smart” Programs can provide single T&E target while producing results for several platforms.
- Validated manpower M&S Tools are needed.
INTEGRATED TEST PROGRAM SCHEDULE
for
CVNX

FY 98 FY 99 FY 00 FY 01 FY 02 FY 03 FY 04 FY 05 FY 06 FY 07 FY 08 FY 09 FY 10 FY 11 FY 12 FY 13 FY 14 FY 15 FY 16 FY 17 FY 18 FY 19 FY 20

CVNX 1 IPPD / System Definition / Design / Ship Construction, Test and Trials / Post Delivery

Milestone I
Milestone II
Start Construction
BT AT
IOC

CVNX 1 Integrated Product and Process, System Definition, Design & Build Contract

CVNX 2 IPPD / System Definition / Design / Ship Construction, Test and Trials / Post Delivery

Start Construction
BT AT
IOC

CVNX 2 Integrated Product and Process, System Definition, Design & Build Contract

Contracting

CVNX 1 DT - I
DT - IIA
DT - IIB
DT - IIC

CVNX 2 DT - I
DT - IIA
DT - IIB
DT - IIC

CVNX Modeling and Simulation, Studies, Analyses, Test and Trials

LFT&E

LFT&E / MGMT Plan
Vulnerability Assessment Report
Vulnerability Assessment Reports

CVNX 1 OT - I
CVNX 1 OT - II

CVNX 2 OT - I
CVNX 2 OT - II

OT&E

CVNX 2 OT - III

DT&E

CVNX Shock Trial (if required)

VAR, DOT&E, BLRIP Reports

FIGURE TI-1