Aircraft Carrier
Ordnance & Material
Stowage & Handling Priorities

11 June 2001
The 21st Century Aircraft Carrier
“An Evolutionary Approach”

EMALS
New Electrical Generation and Distribution
New Propulsion Plant
State-of-the-Art Flight Deck
CVNX 2

Integrated Warfare System
CVNX 1

CVN 77
 Commercial Ship Technologies

CVN 68 Class

Selected Backfit
Hull Improvement
PEO Aircraft Carriers Technology Insertion Opportunities

The Evolutionary Approach ...

Future Carriers

2006 Award CVNX 1 DDC Contract
2007 CVN 77 Delivery
2011 Award CVNX 2 DDC Contract
2013 CVNX 1 Delivery
2017 CVNX 2 Delivery

CVN 77
CVN 76 Baseline R2 Plus:
Integrated Warfare Systems (IW S)
Applicable Change Orders & COTS
Insertion
Smart Carrier Efforts

CVNX 1
CVN 77 IW S Plus:
New Propulsion Plant
Zonal Electrical Distribution System (ZEDS)
Electromagnetic Aircraft Launch System (EM ALS)
Reverse Osmosis Desalination
HSLA-65 Materials Development & Integration
Survivability Options (Long Lead Work)
Other:
Warfare Systems Refresh Ph I

CVNX 2
CVN 1 Plus:
Survivability Improvements To Meet New Threats
Restoration of SLA
Functional Rearrangements
Latest Technologies To Further Enhance Flight Deck Ops,
Including Electromagnetic A/C Recover System (Rotary EARS)
Other:
Warfare Systems Refresh Ph II

In-Service Carriers

2002 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
2006 Award CVNX 1 DDC Contract
2007 CVN 77 Delivery
2011 Award CVNX 2 DDC Contract
2013 CVNX 1 Delivery
2017 CVNX 2 Delivery

CVN 69 RCOH
CVN 70 RCOH
CVN 71 RCOH
CVN 72 RCOH
CVN 73 RCOH

Smart Carriers

Integrated Warfare Systems (IW S)
Applicable Change Orders & COTS
Insertion
Smart Carrier Efforts
Carrier Priorities

• Key Performance Parameters (KPPs)
  – Reduce Vertical Center of Gravity (VCG) and Weight
  – Increase Interoperability
  – Increase Sortie Rate Reduce

• Total Ownership Cost (TOC)
  – Acquisition Cost
  – Manpower - Watch Stations
  – Manpower - Workload
  – Operations & Support (O&S) Cost

• Reduce Total Ship Integration Impacts
  – Electric Load, HVAC, Cooling Water, Arrangement, Supportability
Carrier Logistic Systems Issues

- Material handling should be addressed as an integrated “system” instead of a series of individual steps
- The ability to quickly adapt from a low volume to a high volume material/ordnance movement capability will have to take into account in the Carrier BG internal and external “logistics system” design
- Technology offers an opportunity to integrate order, delivery, strike-down, receipt, stowage, inventory, issue, retrograde, and re-order
- Adding manpower requirements into the material handling equation forces automation into current manpower-intensive material handling process
- Process revision and design and arrangements are as important design enablers as technology
Ordnance & Material Handling Systems

- Deck to Deck Transfer (UNREP)
- Strike-down / Strike-up
- Magazines and Storerooms
- Automated Inventory Tracking and Selective Retrieval
Ordnance & Material Handling Includes...

- Fuel- JP-5, MOGAS, DFM
- Ordnance- Bombs, missiles, mines, components
- DTO and Replenishment repair parts
- Subsistence- Freeze, chill, dry
- Ships store- Clothing, small stores
- Other/Special- nuclear, Level 1, O2 Clean, PUKs
- Consumables- admin, personal clothing, maintenance
- S&TE- Handling equipment, SPETE, GPETE, laboratory

- Mail- Official, personal, bulk
- Retrograde- Reusables, DLRs, recycling
- POL/HAZMAT- maintenance
- Bottled gasses- medical O2
- Medical/Dental- supplies, pharmaceuticals, repair parts
- Habitability- bedding, furniture
- ADP- hardware, software, firmware, peripherals
- Aviation- ALRE, fuel tanks, buddy stores, engines
- Unique- DC, deck, UNREP
- Boats- RHIBs,
Current Limitations
Ordnance & Material Movement is Labor Intensive

- 400+ personnel working parties for major UNREPS/"load aboards"
- Use department personnel for own material movement
- Cumbersome Cargo Flow
  - Pallets/cargo and retrograde moved either by hand, hand trucks or forklifts on hangar bay and flight deck
  - Stores transported to storerooms by hand using vertical package conveyors
  - In-port loading done by pier-side cranes, conveyor belts to lowered elevators or hand carried on board
- Restrictive Weapons Flow
  - Ammo moved to magazines via hand trucks/forklift onto weapons elevators
Current Limitations
Material Handling, Stowage and Visibility

CVN-68 Class Material Handling

- UNREP receive rates far outpace ability to efficiently move cargo into stowage
- 12 package conveyors provided
  - Labor intensive (3 or 4 sailors per load & unload deck just to operate)
  - Work party of 50 (25 per deck) for load & unload
- Food stores broken out daily--STENNIS uses 125 man working party 4 times/day vice conveyors
- Storeroom access very difficult e.g. 1/2 of S-8’s 23 storerooms require opening a 12-tie watertight access hatch
- Parts stored on hangar bay due to lack of storeroom space (hangar bay “Mountain”)
- Lack real-time data bases and direct connectivity to research, locate and request material from other ships in the Carrier BG
Current Limitations
Packaging and Handling

• All Cargo (food, parts, etc) is delivered using pallets
  – 5700lbs. max for CONREP
    • Up to 10,000lbs. special lift for arresting gear cable and jet engines (CONREP only)
  – 4000lbs. max for H-46 VERTREP (3500lbs. SWA)
  – 6000lbs. max for CH-60 VERTREP

• Ordnance
  – Is packaged not to exceed 4000# VERTREP weight limits
    • e.g. 6X500lbs. MK-82 casing = 3000lbs, 2X2000lbs. MK-84 casings = 4000lbs., 1AIM-9X container (4msls) = 1282 lbs.
  – Sized by weapons elevator
  – No maximum volume (ft³) limitation specified, but some precision bomb, bomb kits and missile containers more a volume issue than weight issue
    • Sidewinder (AIM-9) = (2) 55.23 ft³/Cntnr = 2564 lbs. = 1 lift
    • JSOW = (1)100.5 ft³/Cntnr = 2135 lbs.= 1 lift
All departments involved with material handling
Future Ordnance / Material Handling Technologies

- Improved material handling equipment
- Electric elevators
- Automated storage and retrieval systems
- Automated Info Technology solutions
- Clustered storerooms
- Shore-based Interface
- Improved internal arrangements
- Inter-ship / Intra-ship processes

New Technologies, Designs and/or Procedures

The Navy’s 21st Century UNREP and material handling systems must permit sustained and unimpeded Battle Group combat operations
Carrier Logistics Circle of Life

**Presence/Crisis**
- Prior to open hostilities, fuel normally drives UNREP frequency
  - JP expenditure not much different once the air wing starts expending ordnance.

- Current UNREP limitations still applicable in 2015+
- Higher reliance on MSC and charter ships

**Hostilities/Crisis**
- Open hostilities, ammunition resupply drives UNREP frequency
  - Diverse target set requires flexible and responsive ordnance load out capability
  - Ordnance anticipated to be very mission specific requiring continuous asset visibility and tracking (from resupply ship to CVNX magazine to flight deck to aircraft)
- Theater ammunition resupply will impact sustainability
  - Airlift of high priority ordnance will compete for assets

**ISSUE**
- Asset visibility
- Manpower requirements
- Inventory control
- Throughput priorities

**STORE**

**CONSUME**

**STOW**

**RECEIVE**

**RETOGRADE DISPOSAL**

**UNREP/INREP**

Supports warfare operations at the tactical level
- Response to call for fires with precision long range weapons
- Large volume of sorties
Carrier Ordnance and Material Handling Challenges

- Can material handling and ordnance handling equipment be combined to reduce redundancy?
- Can future designs and program goals capitalize on commonalities between processes?
- Does the Navy’s 21st UNREP/material handling systems permit sustained and unimpeded Battle Group combat operations?
Conclusions

• Carriers need new material handling processes and systems in order to operate efficiently in the 21st Century:
  – Fiscal constraints decree a less expensive aircraft carrier
  – Material endurance requirements will be tailored to support Design Reference Mission
  – Process and policy revisions will increase efficiencies
  – Automation / technology are needed
  – Provide / receive services from legacy and new systems
Summary

- *Cost including Manpower and Life Cycle Support, Weight, Vertical Center of Gravity (VCG), and Sortie Rate are critical to selection*

- *Planning for CVNX but transition to In-Service ships first if possible*