



SAFETY

ESOH Challenges in Commissioning an Aircraft Carrier

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11th Systems Engineering Conference

Summary

- **Complex operational environment.**
- **Manning challenges.**
- **Design/Contract challenges.**
- **Equipment challenges.**
- **ESOH challenges.**
- **Hazardous Materials**
- **Safety Equipment**
- **Training**

USS CONSTELLATION (exCV-64)



NGNN Aircraft Carriers



90,000 TONS OF DIPLOMACY

NORTHROP GRUMMAN

Complex Operational Environment

- **Busy place. NGNN has 1000+ cranes, many forklifts, 3 shifts of operation, 19k+ employees.**
 - **COMMERCIAL YARD!**
- **Carrier takes 5 years to build. Some crew there ~2 years prior to commissioning, phased manning.**
- **Carrier build ~\$5.5B + outfitting + modernization. ~ 50M manhours.**

NIMITZ Class (CVN-68)

- **Builder: Newport News Shipbuilding Co, NGNN/NGSB**
- **CVN-68 Deployed: May 3, 1975.**
- **Unit Cost: ~ \$4.5B each, + planes & supplies.**
- **Propulsion: 2 nuclear reactors, 4 shafts.**
- **Length: 1,092 ft**
- **Beam: 134 ft**
- **Flight Deck Width: 252 ft**
- **Displacement: ~ 97k tons (88k metric tons) full load.**
- **Speed: 30+ knots (34.5+ mph).**
- **Crew: Ship's Company: 3,200 - Air Wing: 2,480.**
- **Aircraft: 85**

KITTY HAWK, NIMITZ AND STENNIS- Intended Area of Use = Complex Operational Environment



Photo: US Navy

Design/Contract Challenges

- **1970s Design.**
 - **Little changed from first NIMITZ design.**
 - **Shipalts/mods not normally done at yard, wait on PSA/SRA.**
 - **“As designed/built” to pass INSURV/Navy Acceptance Trials, then many items ripped out/replaced at SRA.**
 - » **Wet Chemistry Photolab.**
 - **FORD design ~complete, little Fleet input.**
 - » **Too late to input ESOH problems now/not in contract.**

BUSH, 2nd with new bulbous bow



Photo: Northrop Grumman

BUSH in drydock, May06

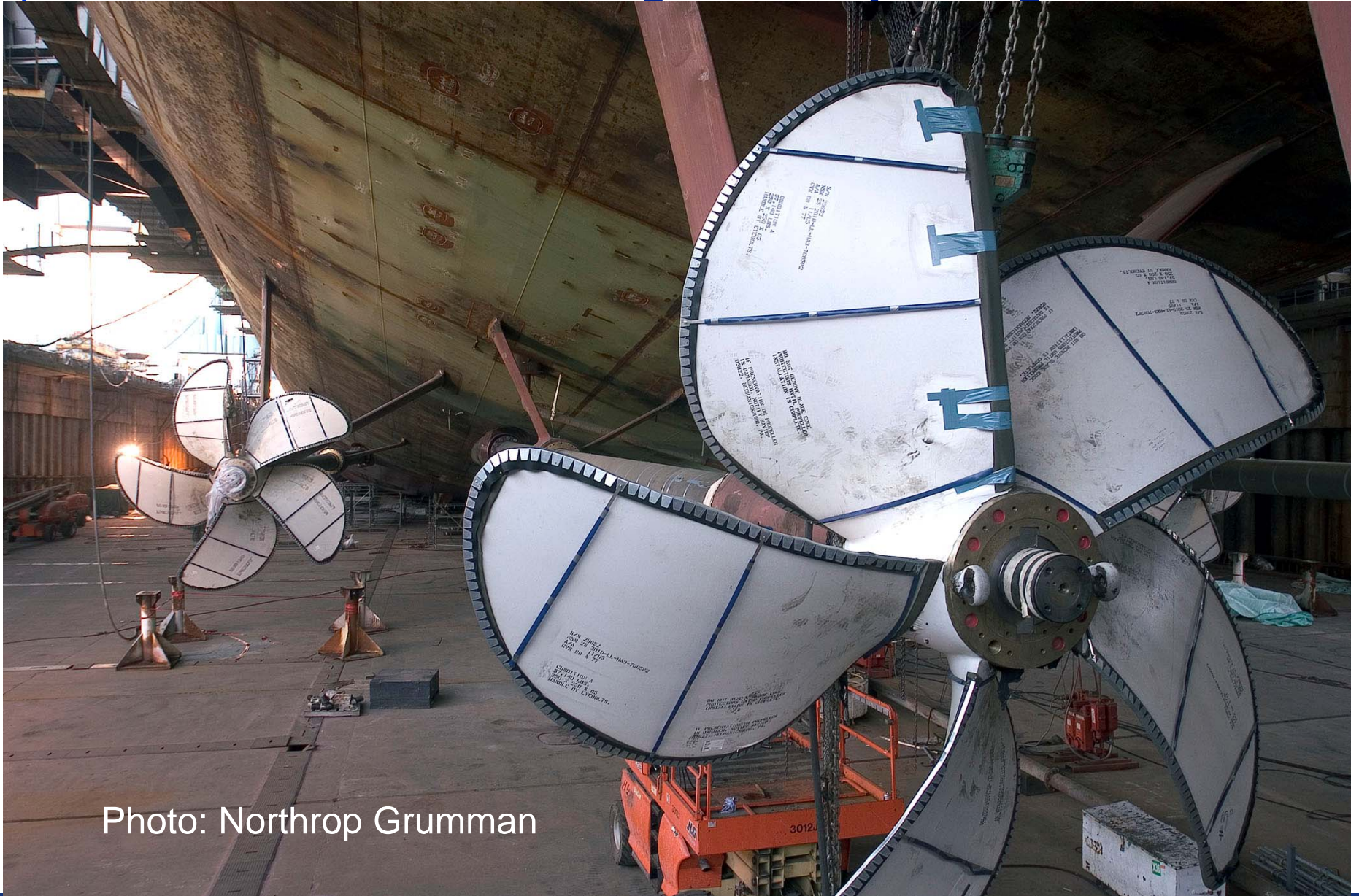


Photo: Northrop Grumman

Superlifts: Upper Bow, Island



Photos: Northrop Grumman

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BUSH in drydock, Sep06

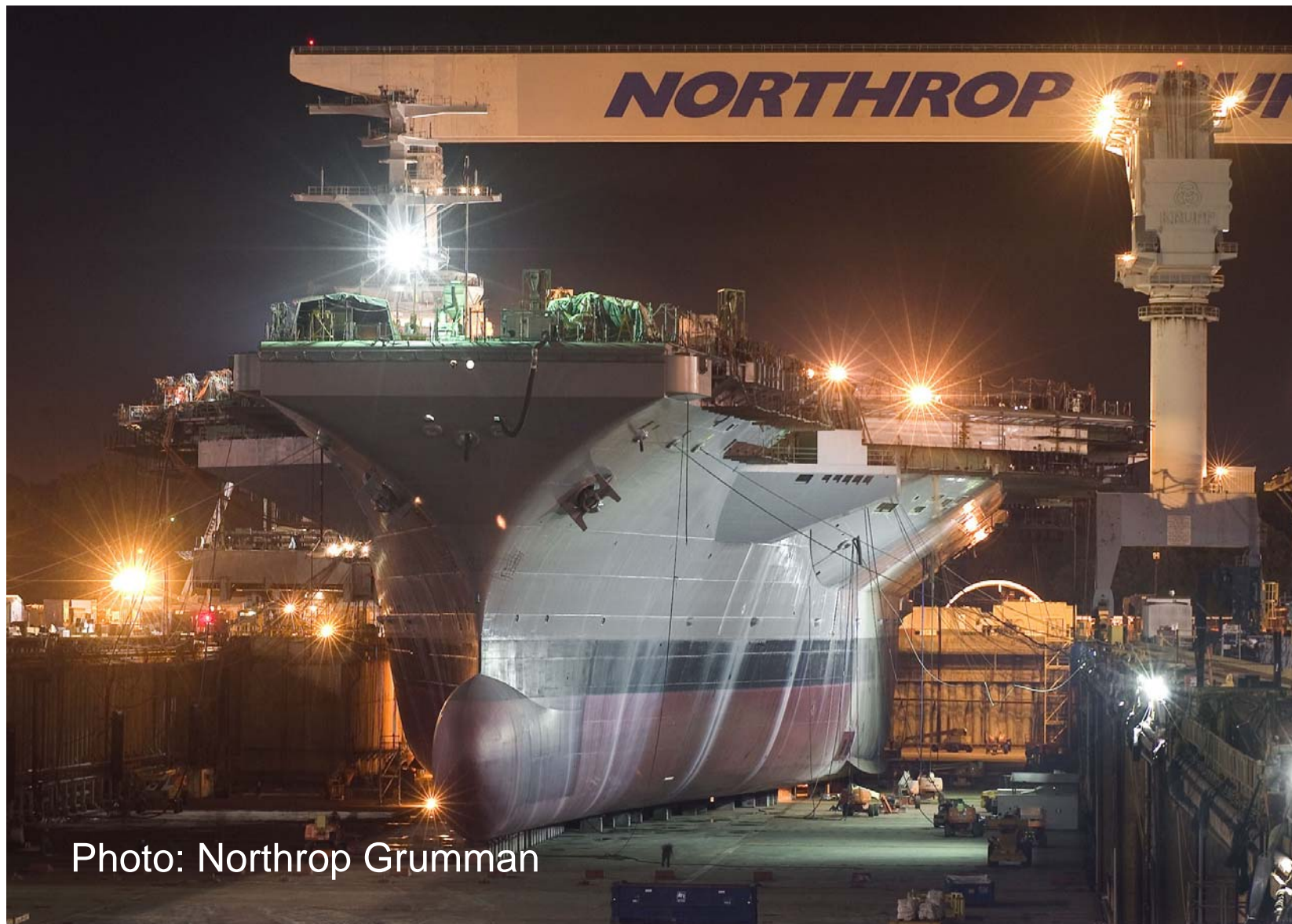


Photo: Northrop Grumman

PCU BUSH Christening, Oct 7, 2006



Photo: Northrop Grumman

Manning Challenges

- **Few people initially. Everyone has multiple jobs.**
- **As Safety Dept and rest man up, most are not trained for primary and collateral duties.**
- **First ship or carrier tour for many.**
- **Safety Dept = TAD bodies.**

Schedule

- **Keel laid: Sep 03**
- **First crew onboard: Jun 06**
- **25% ~Dec 06**
- **50% ~ Jun 07**
- **75% ~ Jan 08**
- **Light off reactor Jul 08**
- **Crew moveaboard Aug 08**
- **Builder's Trials Oct 08**
- **Navy Acceptance Trials Dec 08**
- **Commissioning Jan 09**
- **SRA/PSA Mar 09**
- **Workups/FCT late 09**
- **First Cruise late 2010**

The Ship

- **BUSH Contract awarded January 26, 2001.**
- **Seven-year construction timeframe.**
- **47,000 tons of structural steel and about a million pounds of aluminum**
- **Modular construction process forms large individual units of the ship much like interlocking building blocks**
- **Units welded together to form a module or superlift weighing up to 900 tons.**











The Ship

- **Top speed 30+ knots.**
- **2 nuclear reactors, operate 20+ years without refueling.**
- **~50 years lifespan.**
- **Three two-inch diameter arresting wires on the flight deck bring an airplane going 150 MPH to a stop in < 400 ft.**

ESOH Challenges During Construction

Equipment Challenges

- **Buy initial outfitting items, no gear comes with the job.**
- **AELs are wrong.**
- **Supply Dept undermanned, no HAZMAT program.**
- **RPPPO untrained.**
- **Byzantine supply system (not standard methodology).**

ESOH Challenges

- **Getting people to wear PPE.**
- **Constant training challenges- new people, new equipment, new systems, complex operations.**
- **Commercial yards have their own rules- some are arbitrary.**
- **Navy DOES NOT OWN THE SHIP, DOES NOT OWN THE YARD.**
 - **Barge, rented offices, Huntington Hall.**

Street View

More...

Map

Satellite

Terrain



ESOH Challenges

- **Shipyard owns emergency (med, spill, fire, envm) response until move-aboard.**
- **While working aboard, follow yard rules- if we know/understand them.**
- **SUPSHIP is intermediary.**

HAZMAT Challenges

- **One BM2/9595 for first year (Jul06-Dec07).**
- **No AUL, limited visibility on ordering.**
- **SERVIMART provides HAZMAT- which may be fine for shore offices but not usable onboard.**
- **Safety Dept BM1/SK1 9595- late arrivals (Mar08).**
- **Have/use HAZMAT before program in place.**
 - **Training, Hazcomm standard, PPE, disposal.**

Safety Equipment Not Available Until Crew Moveaboard

- **Just Prior To Builder's Trials**
- **195 List/Exclusion Items:**
 - **EEBDs & SCBAs.**
 - **Bull's Eyes, CCOLs, SIB.**
 - **Fire fighting equipment.**
 - **Ladder chains.**
 - **Nonskid decks.**
 - **Deck coverings & deck markings.**
 - **Warning Labels/SOPS/Operator Placards.**

Training Challenges

- **Many new, unique, untried systems.**
- **Navy crew doesn't own systems, yard does initially.**
- **Vendor prepares maintenance + training pubs- often late in the game.**
- **Crew must be trained/prepared for ATG Crew Certification, Builders and Navy Acceptance Trials.**

Recommendations

- **Standardize and implement consistent, timely SSWGs and allow changes to contract and design early in design cycle.**
- **More fleet/user community involvement, earlier- and USE their suggestions.**
- **Make and use passdown/lessons learned.**
- **More SUPSHIP oversight during all phases of build process.**

CVN-78 Plan

Enhanced Ship Self Defense

Evolved Sea Sparrow Missile

Improved Weapon & Material Handling

Outboard Weapons Elevators

Heavy Underway Replenishment

Double Height Magazines & Storerooms

Integrated Island

Composite Mast

Smaller Island Re-Positioned Aft & Outboard

MFR/VSR Radars

Joint Precision Approach and Landing System

Advanced Arresting Gear

Underwater Protection

Improved Survivability

Zonal Electrical Distribution System

New Propulsion Plants

All Electric Aux Services

New Propulsion/Electric Plant

Hangar Bays (2)

4 ElectroMagnetic Aircraft Launching Systems (EMALS)
Advanced Jet Blast Deflectors

Aircraft Elevators (3)

Enhanced Flight Deck

Enlarged Flight Deck Footprint "Pit Stop"

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