Building a Bridge of Ships: Fairfield Shipyard* To Today's U.S. Shipbuilders

Bob Keane, Ship Design USA, Inc.

*Joseph Abel, Research Historian, Formerly Baltimore Museum of Industry

NSRP
NATIONAL SHIPBUILDING RESEARCH PROGRAM™
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1943 Bethlehem Fairfield Shipyard-Liberty Ships*

- Modular construction: components built at fabricating shop
- Transported to the ways for staging and final assembly
- Proved to be extremely efficient & was adopted by other shipyards
- Liberty ship production improved from 245 days to 30 days
- From 1941- 45, 384 Liberty ships, 94 larger Victory ships and 45 LSTs
- **"bridge of ships" connected US farms & factories to battlefields of Europe and Asia**

*Joseph Abel, Baltimore Museum of Industry

Speed at Point of Need: Fairfield Shipyard-Liberty Ships

- National Security Need
  - A world war to win and many ships to build
- Government-Industry Collaboration
  - US Maritime Commission's emergency shipbuilding program of 1941
  - Commission modified British design to improve producibility
- Optimum Layout of Shipyard
  - To improve workflow and material handling
- Modular Construction Manufacturing Process
  - Components built at fab shop, then transported to ways for staging and final assembly
- Trained Workforce
  - 12-week program of classroom and on-the-job training

Fast Forward to 1980's 600-Ship Cold War Fleet

- Group Technology / Advanced Outfitting
- USS Ohio (SSBN-726), largest submarine ever built, carried 24 Trident I nuclear missiles.
- Stepped up construction of nuclear-powered Nimitz-class carriers, Los Angeles-class attack submarines
- Ticonderoga-class guided missile cruisers equipped with Aegis antiair warfare system.
- Completed design of Burke-class Aegis destroyers
- By 1990, US Navy operated the most powerful fleet on earth with:
  - 15 carrier battle groups,
  - 4 battleship surface action groups,
  - 100 attack submarines, and
  - scores more cruisers, destroyers, frigates, amphibs, and auxiliaries.
- **The Fleet could force Soviet Union to fight disadvantageous 2-front war in Europe and Far East**

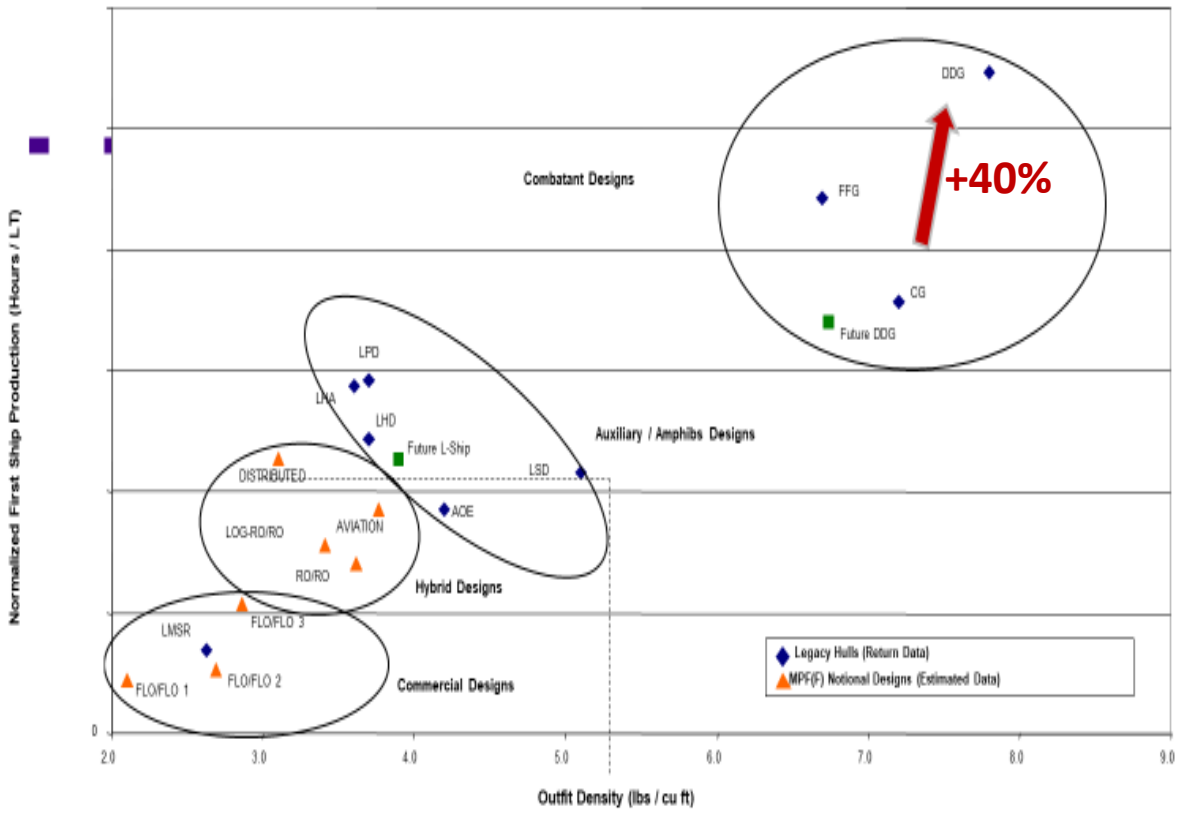
Speed at Point of Need: 600-Ship Cold War Fleet

- National Security Need
  - SECNAV persuaded Congress a Maritime Strategy with a “600-ship Navy” was needed to defeat Soviet Union.
- Collaborative Concept Formulation (CONFORM) R&D Program
  - Example: TAGOS 19 SWATH Design to Shipbuilding Contract in less than 12 months
- Ship Characteristics Improvement Board (SCIB)
  - Collaboration between stakeholders in OPNAV, NAVSEA, ASN(RDA)
- Government-Industry Collaboration
  - NAVSEA-led, Navy-Industry Collaborative Ship Designs
  - National Shipbuilding Research Program – SNAME Ship Production Cmte.
  - Group Technology Transfer from NSRP Projects
- New CAE/CAD/CAM tools
- Muti-Year Procurements
- Trained Workforce
  - NAVSEA recruiting 40+ engineers/year for 3-year Engineer-In-Training (EIT) Program

Nation Takes the "Peace Dividend"

- US Navy's warship design capability envy of the world
- Cold War ended with little competition on the horizon
- Warfighting success of CG/DDG/LHD/LPDs with the Fleet
- Nation took the "peace dividend"
- Investments ceased in robust organic ship design capability
- A generation of "know how" was lost
- Skilled workers retired without passing on knowledge
- Other investments in infrastructure declined dramatically

Lessons Learned: Design for Producibility



Ship Production hours increase with density and fall into predictable groupings

- Don't arbitrarily constrain ship size
- Don't relate lightweight to reduced cost
- Reduce number & types of parts
- Use common parts, ship to ship, program to program
- Align structural arrangement
- Common MMR/AMR arrangement
- Auxiliary systems are "killers"
- Higher fidelity of early design definition
- Design to Build Strategy
- Finish design before cutting steel
- Finish outfitting, early systems installation, integration & test before launch
- Include shipyard production engrs on Navy-led design teams

Speed at Point of Need: Building A New Bridge of Ships

- National Security Need
  - SECNAV persuade DoD/WH/Congress on a strong shipbuilding Maritime Strategy
- Focus on Affordability Through Strategic Innovation and Technical Excellence
  - Rather than squeezing cost at the ship or system levels
- OPNAV User-Driven, Navy-Led, Navy-Industry Collaborative Design & Acquisition Strategy
  - CNO Gilday: next guided-missile destroyer design will be led by Navy to reduce technical risk,
  - CNO added it's a team with both shipbuilders, but initial design is Navy led.
  - Navy-Industry Executive Oversight Board can help change "old habits", facilitate improvements
- Focus on enterprise-wide communications and processes for increasing throughput
  - Latest Integrated Product Data Environment (IPDE) Technology
- NSRP one of the most important collaborations across any industry in US and the world
  - Has developed large body of knowledge – Navy & Industry must collaboratively implement results
- Out of CISD a modern, agile workforce integrated with industry and academia partners
  - with most modern, integrated tools and 21st century facilities-– Mr. Stefany, Acting ASN(RDA)
- Muti-Year Procurements
  - Shipbuilders can establish long-term relations with major vendors

Affordability Through Strategic Innovation and Technical Excellence

- Finding dramatic cost reductions requires more holistic view of mission needs, assumed resources and innovative solutions
- Vast majority of acquisition and lifecycle costs locked in by baseline solution directed by Navy
- Pre-acquisition trade-offs at system or even mission requirements levels hold potential for radical affordability improvements
- Yet, there is no standing constituency, funding, or commitment for thinking in these terms
- Put simply, Navy and its contractors must propose bolder solutions to platform or system requirements and new ways to perform missions
- **FY24 pre-acquisition CONFORM (COLLECT) R&D Program to conduct ship concept studies to design "Future Bridge of Ships"**

Modern, Agile Workforce: Navy-Industry-Academia Partners

Mr. Jay Stefany, Actg. ASN(RDA), at CISD 20th Anniversary, 2022

Now just returning to the way it used to be in the 1980s won't be good enough to address the competition we face. What grows out of the CISD effort in the coming years needs to be a modern, agile workforce integrated with our industry and academia partners, with the most modern and integrated tools and 21st century facilities that support US Navy-led surface ship designs at all stages of the design process, a true world-class surface warship capability – which is then sustained.

Designing and Building the Future "Bridge of Ships"

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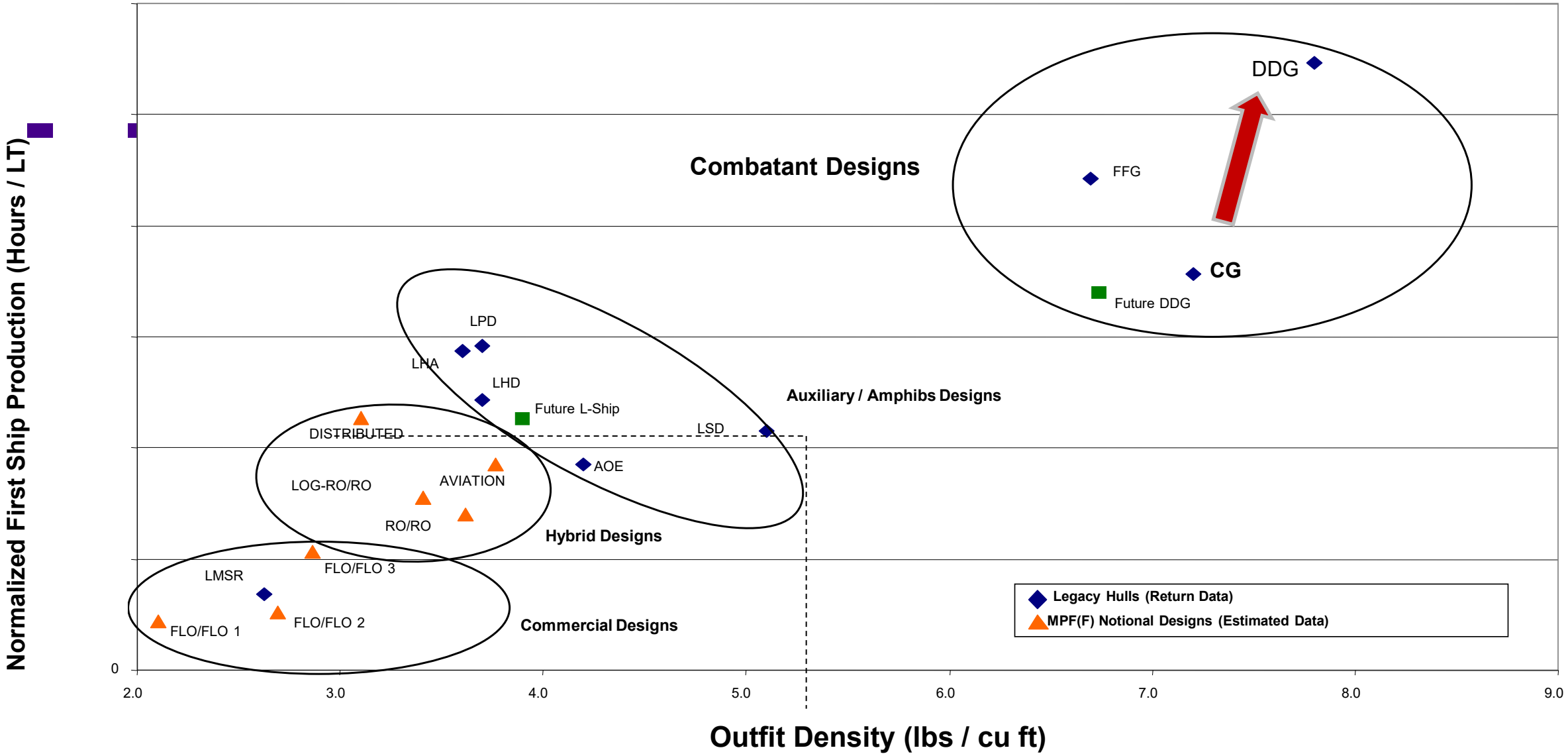

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