

Naval Surface Warfare Center, Carderock Division

AMERICA'S FLEET STARTS HERE



Naval Architecture and Engineering Department, (Code 80)

Michael Brown, Department Head

CAPT Mark Vandroff
Commanding Officer, NSWCCD

June 12, 2018

Dr. Paul Shang
Technical Director (Acting), NSWCCD

Presentation Overview

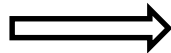
- Introduction
- Organization
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 - Capabilities
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 - Fleet Support
 - Computational Fluid Dynamics
 - Combatant Craft Division
 - Advanced Propulsor
 - Vendors
- Future Competitive Requirements



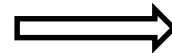
Naval Architecture and Engineering Department

- Cradle-to-Grave Naval Architecture and Engineering of Ships, Submarines, Boats & Craft, Unmanned Systems, and other Maritime Systems
- Early concept/design development and trade-off studies through cost analysis, detailed hydrodynamic and propulsor design, maneuvering and ship control, model testing, ship systems integration, full-scale trials and operational support.

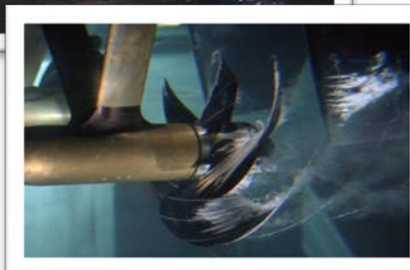
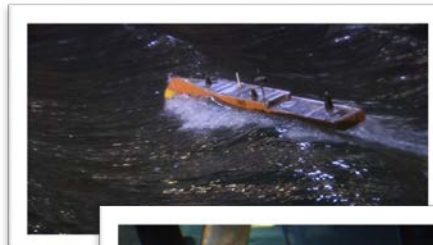
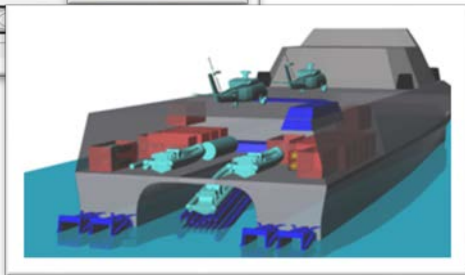
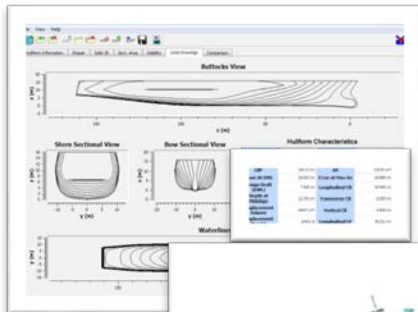
Concept development
and early design



Small scale test
and evaluation



Full scale tests,
evaluation and trials



Organizational Structure

Support Staff

**Naval Architecture and Engineering
Department Head (Code 80)**

**Deputy Department Head
(Code 801)**

**Director for IT
Development (Code 802)**

**Director for Science &
Technology (Code 803)**

**Senior Technical
Management (Code 804)**

**Chief Engineer
(Code 805)**

**Future Submarine
Integration (Code 806)**

**Business Operations
(Code 807)**

**Propulsor Design &
Manufacturing (Code 808)**

**Administrative Officer
(Code 809)**

Technical Divisions

**Ship and Submarine
Acquisition Engineering
(Code 81)**

**Future Concepts & Design
Integration (Code 82)**

**Combatant Craft
Little Creek
(Code 83)**

**Naval Architecture and
Engineering
(Code 84)**

**Surface Ship
Hydromechanics
(Code 85)**

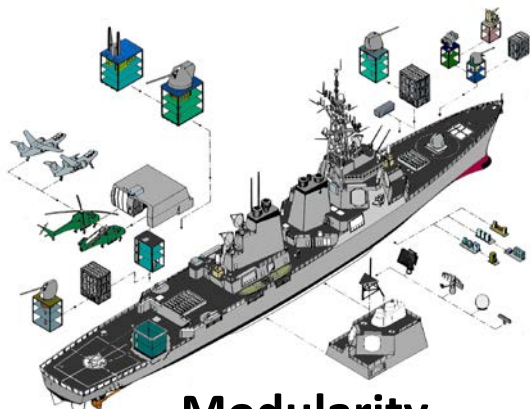
**Submarine Maneuvering
and Control
(Code 86)**

**Computational Fluid
Dynamics & Propulsors
(Code 87)**

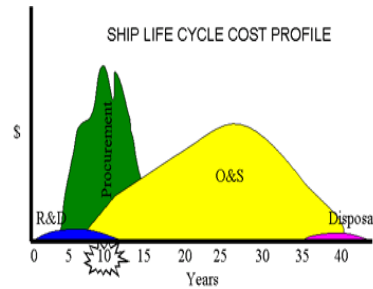
**Marine, Aviation &
Unmanned Systems
(Code 88)**

**Facility Engineering and
Operations
(Code 89)**

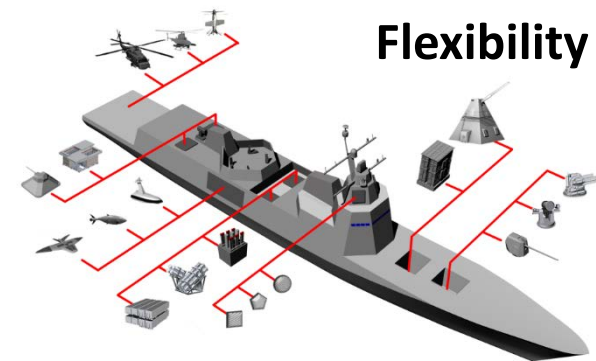
Spotlight on Ship Design



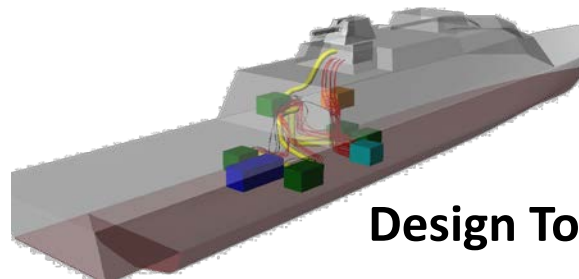
Modularity



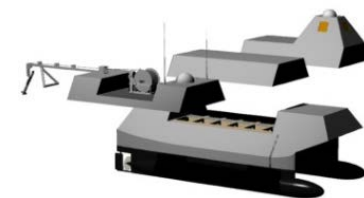
Cost Engineering



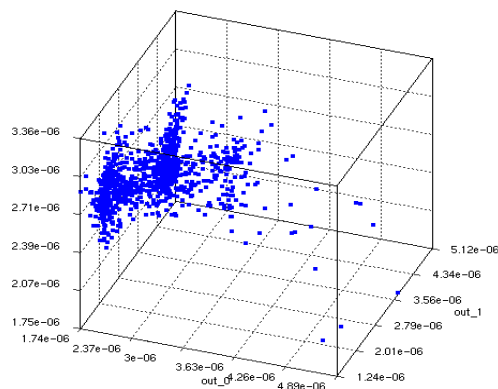
Flexibility



Design Tools



Future Concepts



Set Based Design

Related contracts: Ship cost estimating; Knowledge based services (KBS); Intelligent Systems; Model Design & Fabrication (MDF)

Spotlight on Testing Facilities

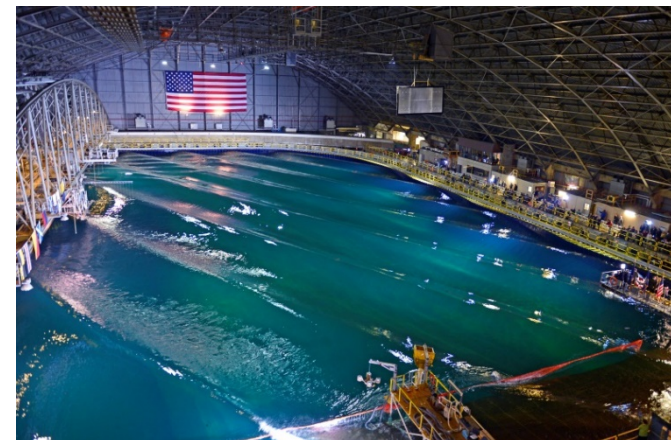
David Taylor Model Basin

- Regularly used since WWII for Resistance and Propulsion testing of Ships, Submarines, and submersible systems
- Wavemaking and high speed test capability
- Testing supports component design, modeling & simulation tool development



Maneuvering and Seakeeping Basin (MASK)

- Built in 1960's and modernized in 2013
- World class wave-making capability
- Regularly used for seakeeping, maneuvering, and control system tests for ships and submarines
- Testing supports modeling and simulation tool development and fleet guidance



Several related large contracts and SAP procurements

Spotlight on Fleet Support Activities

COLUMBIA-CLASS Submarine Design

- Naval Architecture and Ship Design Management
- Propulsor Design, Development, and Manufacturing
- Ship Control System design and validation

Surface Ship Model Testing

- Performed in MASK and open water
- Characterize ship behaviors
- Identify safe and unsafe operating conditions to produce Fleet Guidance products
- Enhance simulation capabilities

Boat and Craft In-Service Engineering

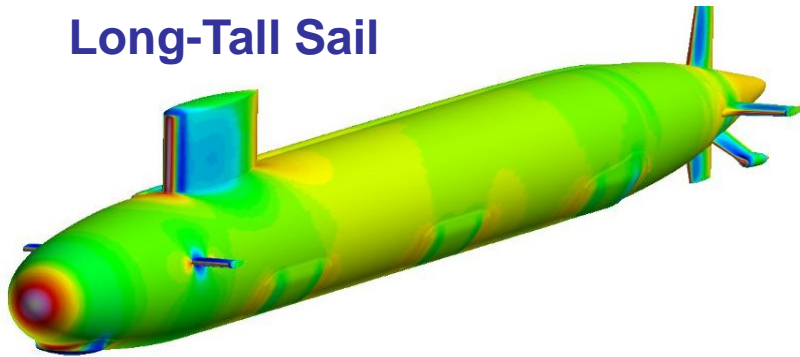
- In-Service Engineering Agent
- Planning Yard / Marine Boatyard Services
- Distance Support
- Training and Familiarization

**Related contracts: Knowledge based services (KBS);
Intelligent Systems; Model Design & Fabrication (MDF);
Several Little Creek Contracts**

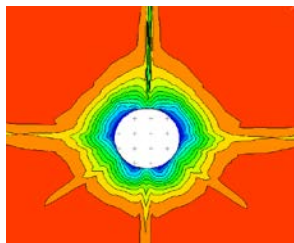
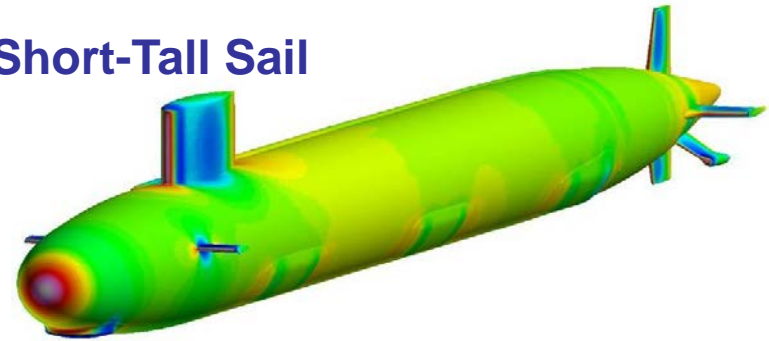


Spotlight on Computational Fluid Dynamics Capability

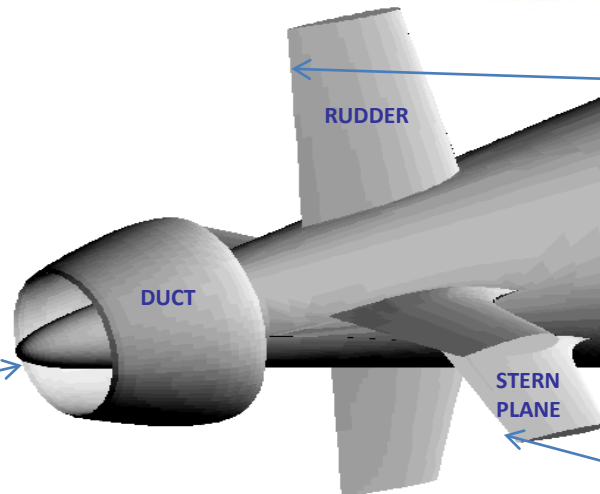
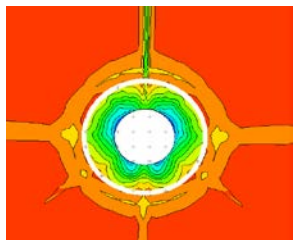
Long-Tall Sail



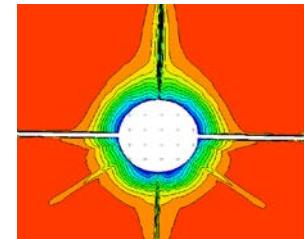
Short-Tall Sail



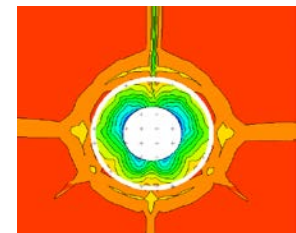
Duct Inlet



Rudder Trailing Edge



Stern Plane Trailing Edge



Related ongoing contracts:
MPCUGLES; CSRA FD11; SAP Procurements
Massively Parallel Computations on Unstructured Grid Large Eddy Simulation

Spotlight on Detachment



Combatant Craft Division

Full Spectrum

- Naval Architecture
- Design & Engineering
- Survivability
- Transportability
- Human Systems Integration
- Test & Evaluation
- Logistics
- Life Cycle Management
- Industrial Support

Full Life Cycle

- Craft Research & Development
- Craft Acquisition
- Craft Sustainment

Total Systems Engineering

Related contracts: Engineering services for combatant craft; Watercraft industrial support (WIS); Intelligent systems; Advanced systems prototyping

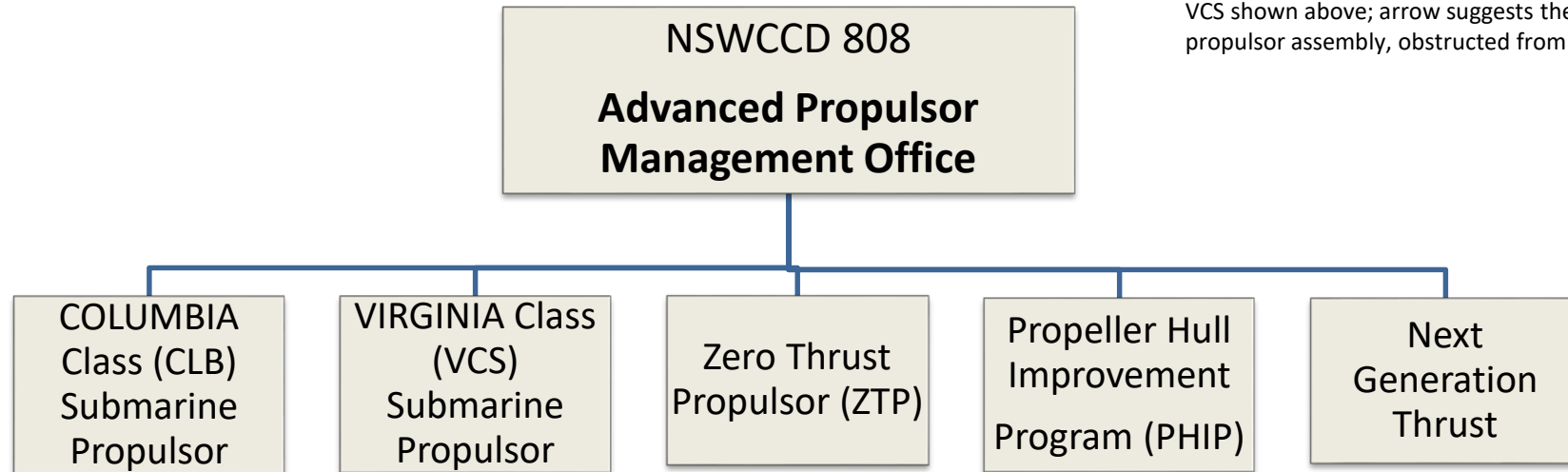
Spotlight on Advanced Propulsor Design & Manufacturing

Submarine propulsors are complex, Government Furnished Equipment (GFE), with long timelines for design and development, including stringent performance requirements and critical delivery dates.

C/808 is responsible for the design (design agent) and manufacture (shipbuilder) of submarine propulsors.

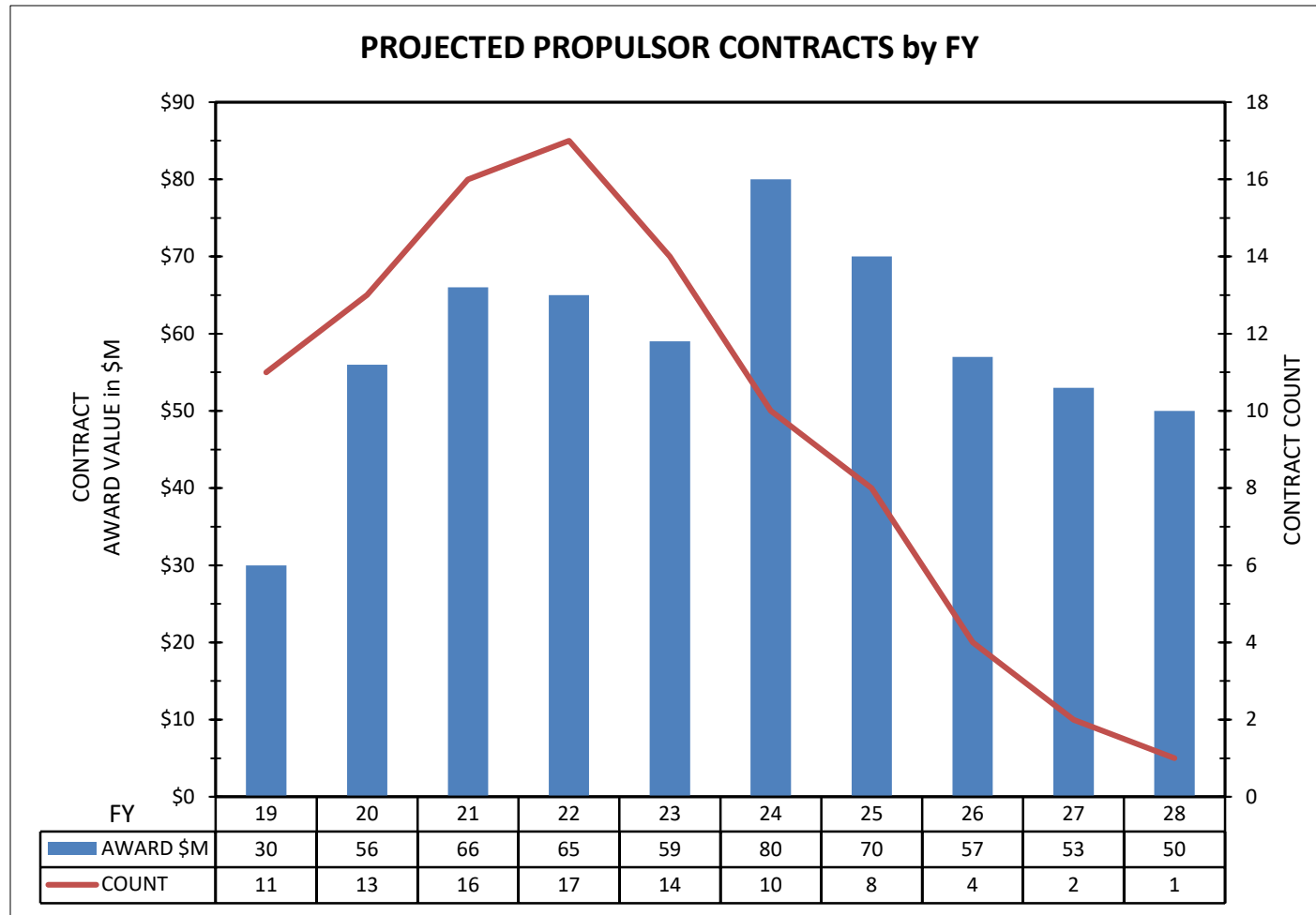


VCS shown above; arrow suggests the entire propulsor assembly, obstructed from view.



Propulsor Planning

- Coordinated production across CLB and VCS is required to support the “350 ship Navy” plan (as of 2017).
- Out-years suggest an inventory gap thereby emphasizing partnership with the Defense industrial base now.



Propulsor Manufacturing Capabilities

Examples for submarine propulsor production include:

1. Casting (nickel-aluminum-bronze)
 - a. Casting inspection & qualification
 - b. Weld repair
2. Precision high speed machining
 - a. Vertical turning lathe
 - b. 5-axis contour machining
3. Forging (NAB, Monel)
4. Welding of large assemblies (incl. Inconel, Monel)
5. Blast & paint (high solids)
6. Non-destructive testing (PT, MT)
7. Composite GRP construction
8. Composite foam fills (e.g. syntactic foams)



Six new propulsor manufacturing related contracts to be awarded by FY19 Q4; R&D and production level work

Spotlight on Vendors

We need your ideas and
creativity to help solve our
Technical Challenges !

Dept 80 - Long Range Acquisition Forecast

Requirements Description	Location	Incumbent	Anticipated Total Value (\$M)	Anticipated Acq Strategy	Anticipated Solicitation Date	Estimated Award Date
Ship Cost Estimating	WB	New	5.0	Small Bus	FY18 Q4	FY19 Q1
Business Services	WB	New	4.0	TBD	FY18 Q4	FY19 Q1
Watercraft Industrial Support (WIS)	LC	New	20.0	TBD	FY19 Q2	FY19 Q3
Knowledge Based Services (KBS)	WB	CSRA	20.0	TBD	FY19 Q2	FY19 Q3
Model Design & Fabrication (MDF)	WB	New	24.0	TBD	FY19 Q2	FY19 Q3
Intelligent Systems	LC	New	20.0	TBD	FY19 Q3	FY19 Q4
Engineering Services for Combatant Craft	LC	CDI Marine	60.0	TBD	FY19 Q4	FY20 Q1
Advanced Systems Prototyping	LC	New	20.0	TBD	FY19 Q4	FY20 Q1
VCS Hub Scoop Bar (HSB) Production	PROP	New	3.0	TBD	Jul-18	Sep-18
VCS Plug Production	PROP	New	3.0	TBD	Jul-18	Sep-18
APMO Propulsor Demonstration Hardware	PROP	New	30.0	TBD	FY19 Q1	FY19 Q4
CLB BSS Inseparable Assembly Production	PROP	New	19.0	TBD	FY19 Q2	FY19 Q4
VCS Multi-rotor/stator/HSB Production	PROP	New	40.0	TBD	FY19 Q2	FY19 Q4
APMO Non-metallic Materials R&D	PROP	New	50.0	TBD	FY19 Q3	FY20 Q4
Total			268.0			

Points of Contact

Acquisition Manager (WB & LC), Dave McAfee, david.r.mcafee@navy.mil
Propulsor Acquisition Manager, Frank Jurado III, frank.jurado@navy.mil