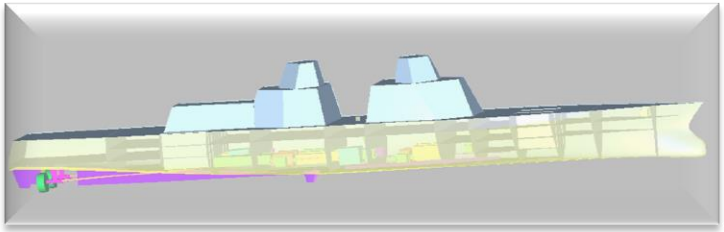
CARDEROCK DIVISION


# *Department Overview Brief*


***Jon Etxegoien,***
*Department Head*

## Mission:

- *Provide full-spectrum Naval Architect and Engineering expertise and tools to design, engineer, and integrate surface, combatant craft, and undersea vessels as total systems*
- *Enable sub-system improvements by assessing their effectiveness and affordability at the system level and from a total life cycle perspective*
- *To conduct hydromechanics research, development, testing, and evaluation for the U.S. Navy, government agencies and marine and related industries*



# Organization



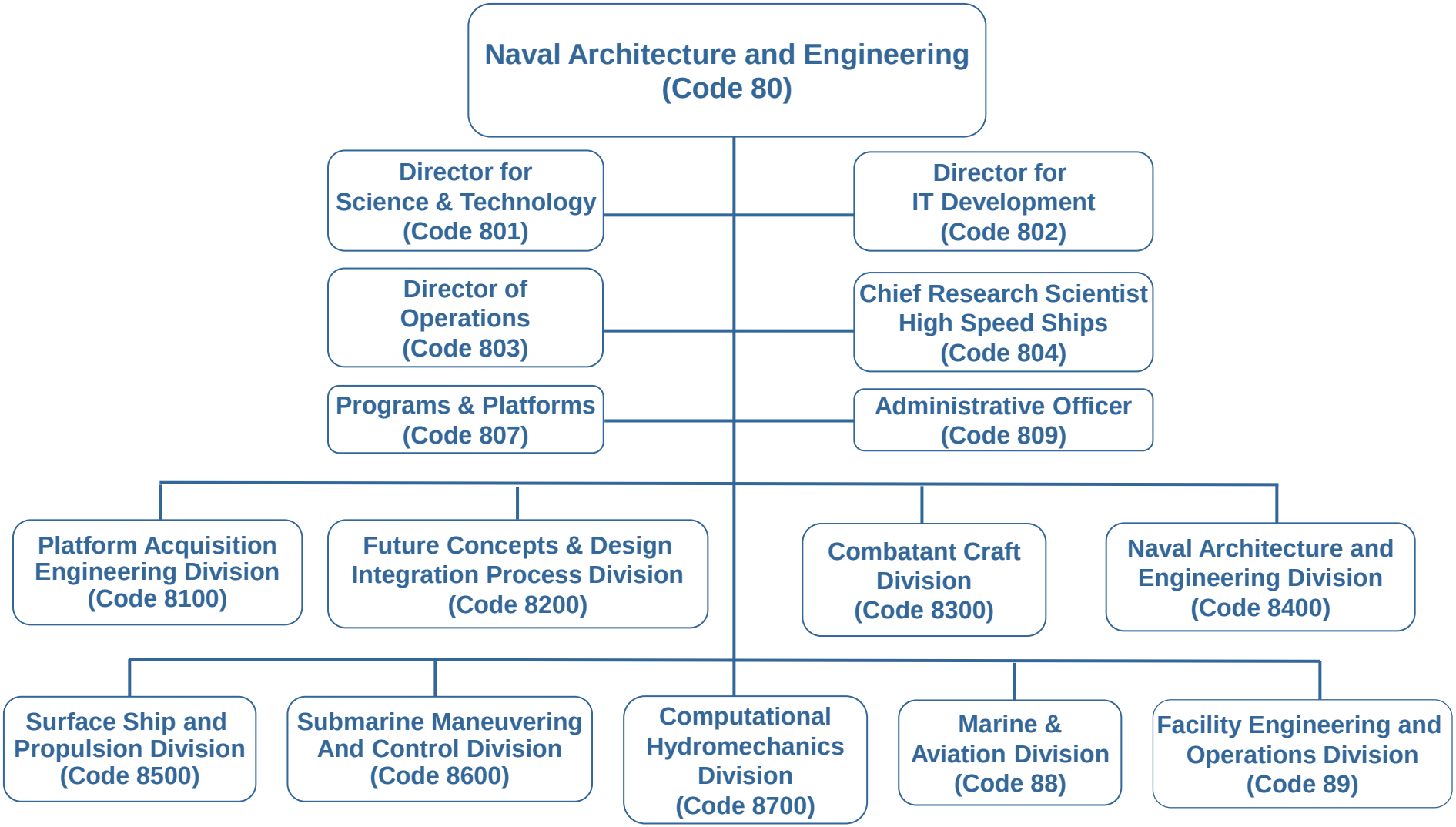
***What we do:***

***Perform research, engineering and naval architecture on surface and submarine vessels, combatant craft, and unmanned systems in the areas of hull forms; propulsion; platform dynamics; hydrodynamics; and conceptual, preliminary, & contract design including analysis of alternatives, specifications, technology assessment, and general arrangements***

***What we Provide:***

- ***A variety of computational tools and model / full scale testing to develop and evaluate ship, submarine, and propulsor concepts and designs***
- ***Direct support to the Fleet by conducting full-scale trials and solving operational problems in the areas of hydromechanics***
- ***Cradle to grave total engineering and lifecycle support for small boats and craft***
- ***Naval architecture and engineering services to acquisition programs***

# Naval Architecture and Engineering Department (Cd 80) Organization



# Organization

- Ship, Submarine & Aircraft Carrier design management support
- Program life cycle cost estimates (PLCCE), and cost/benefit analyses for the total ship, ship systems, craft and boats
- Ship and ship systems technology needs, documents, and technology readiness level assessment (TRLA)
- Early stage ship design tools and processes (ASSET, LEAPS, etc.)
- Ship, submarine and advanced naval capability concepts & technologies
- Product data acquisition, integration methods & technologies
- Full spectrum, full life cycle support of all boats and crafts
- Ship general arrangement products (drawings, product model configurations, etc.)
- Systems engineering & weights and stability analyses for ship systems and equipment
- Platform & Mission System RMA

# Organization

- Submarine Maneuvering and Control Systems Design and In-Service Engineering fro Fly-by-wire
- Hull Resistance (Surface/Sub) Evaluation and Design Support
- Seakeeping Performance Prediction and Assessment
- Propulsor Design (Surface/Sub)
- Wave Loads (Surface/Sub)
- Computation Fluid Dynamics Predictions and Development
- Full Scale Trials
- Towed arrays and towed vehicle design and evaluation
- Ship/Aircraft interface design

# 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

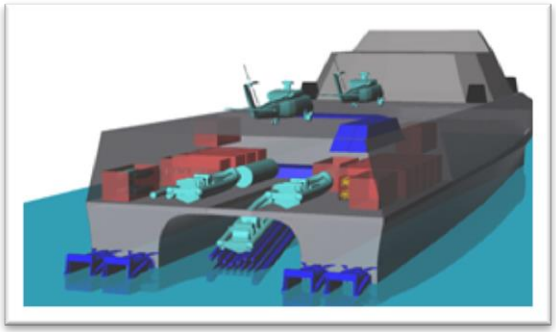
- Craft Research & Development
- Craft Acquisition
- Craft Sustainment

# Total Systems Engineering

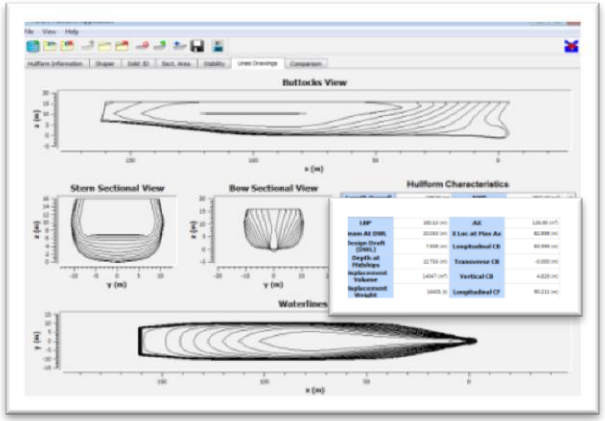
NAVSEA WARFARE CENTERS Carderock

# Naval Architecture of Ships, Submarines, Boats, Craft, and other Naval Systems

**Early concept/design development and trade-off studies through cost analysis, detailed hydrodynamic and propulsor design, maneuvering and ship control, model testing, internal arrangements, ship systems integration, full-scale trials and operational support**



**Concept development and early stage design**




**Small scale test and evaluation**

**Full scale tests, evaluation and trials**

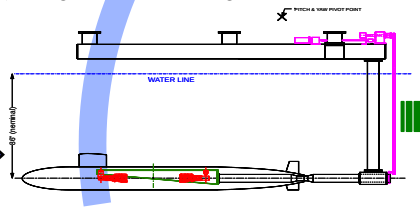
Other facilities are used on an as-needed basis to conduct specialized experiments that provide data (e.g., wave impact loads, torques, etc.) which supplements and complements the Characterization Process.

Increasing Accuracy

SMALL-SCALE FREE-RUNNING MODEL

LARGE-SCALE VEHICLE

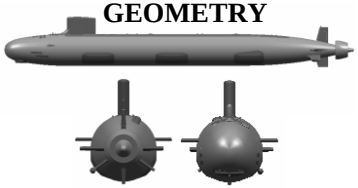
CAPTIVE MODEL
(Straight-line, Rotating Arm Strut & Sting)




SIMULATION & ANALYSIS

FULL-SCALE TESTS

HULL & APPENDAGE GEOMETRY



- Submerged Operating Envelope
- Fleet Guidance
- Ship Systems Manuals
- Automatic Control Algorithms
- Ship Control Trainers
- Hydro Loads for
  - Structural Calculations
  - Control Surface Actuator Loads
- Shipyard Support
- TEMPALTS
- OPALTS

# Many Large & Small Business Partners

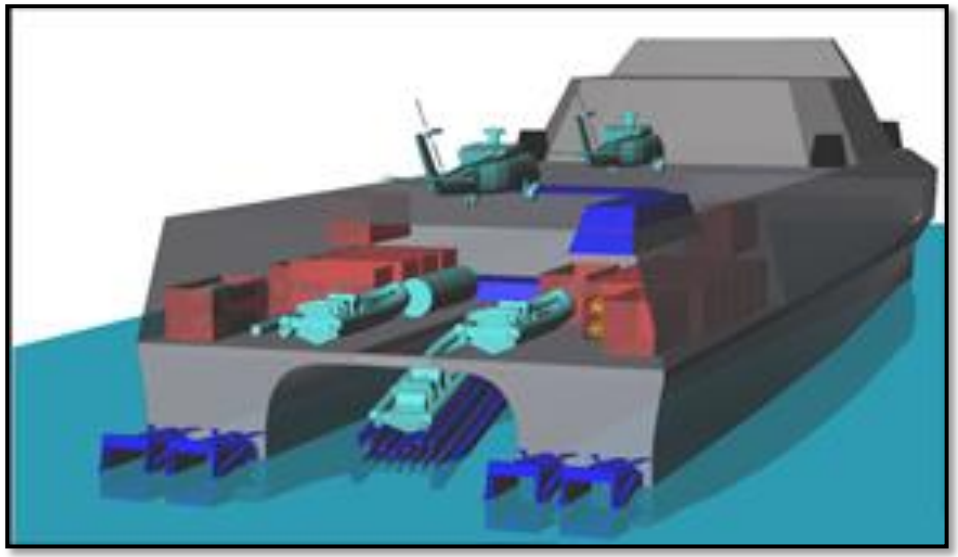
- LEIDOS
- URS
- MAR
- ORBIS
- STRATEGIC INSIGHT
- ABBOTT ON CALL
- TECHNOMICS
- CSC
- DRAPER
- CDI MARINE
- SEAWARD SERVICES
- PROFESSIONAL SOFTWARE ENGINEERING
- QUADELTA
- MARINE DESIGN DYNAMICS
- GIBBS & COX

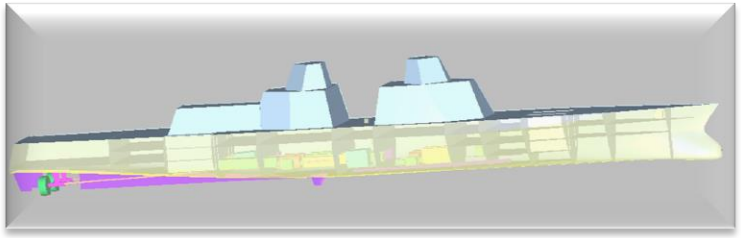
**Plus Many More…. How About You?**

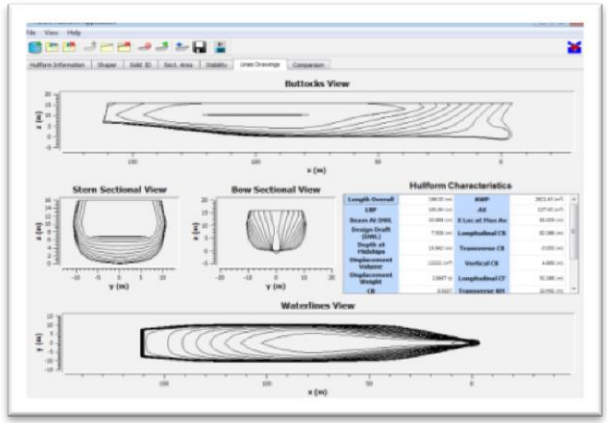
# Projected Areas for Future Growth

## We Need Your Ideas and Creativity to Solve Our Technical Challenges !

# Highlighted Future Growth Area: State of the Art Modelling and Simulation Technologies to Provide New Ways to Visualize, Design, and Analyze Ships and Ship Systems



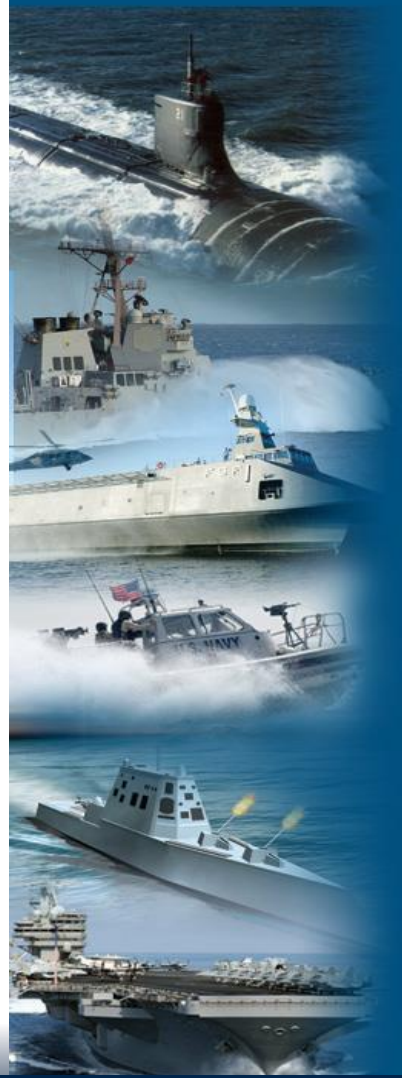




# Combatant Craft Operating Worldwide

Highlighted Future Growth Area: All Phases of Life Cycle Support for Combatant Craft; R&D, Design, and In Service Engineering. Exciting New Technology Challenges for Fully Unmanned, Autonomous Craft

# Many More Projected Future Growth Areas…



- Computation Fluid Dynamics Predictions and Development
- Ship Cost Estimating and Analysis
- Full Scale Trials, Maneuvering, Stability, Control, Motions, Stability and Seakeeping
- Propulsor Design (Surface/Sub), Model Fabrication, Welding
- Systems Acquisition Planning, Program Management / Platform Support Services
- Life Cycle Design, Engineering, Maintenance, Testing, and Troubleshooting of Ship Systems and Associated Technical Data, Software, and Hardware.
- Advanced 3D Ship Drawing Formats
- Ship/Aircraft Interface Design, Towed Vehicle Design
- Instruction for our Workforce in Advanced Computer Tools (CAD, CFD, Early Stage Design, Cost Estimating, Risk)